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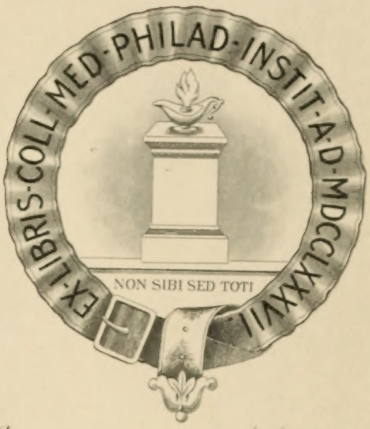

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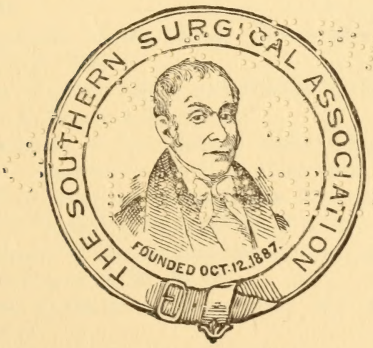

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1917

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H. A. ROYSTER, M.D., *Secretary*,
RALEIGH, N. C.

DORNAN, PRINTER
PHILADELPHIA

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LIST OF OFFICERS

FROM THE ORGANIZATION TO THE PRESENT TIME.

* Deceased.

	President	*Vice-Presidents*	*Secretary*	*Treasurer*
1888.	*W. D. Haggard	R. D. Webb J. W. Sears	*W. E. B. Davis	Hardin P. Cochrane
1889.	*Hunter H. McGuire	W. O. Roberts *Bedford Brown	*W. E. B. Davis	Hardin P. Cochrane
1890.	*George J. Engelmann	*Berthold E. Hadra Duncan Eve	*W. E. B. Davis	Hardin P. Cochrane
1891.	Lewis S. McMurtry	*J. McFadden Gaston J. T. Wilson	*W. E. B. Davis	Hardin P. Cochrane
1892.	*J. McFadden Gaston	*Cornelius Kollock *George Ben Johnston	*W. E. B. Davis	Hardin P. Cochrane
1893.	*Bedford Brown	*Joseph Price George A. Baxter	*W. E. B. Davis	Hardin P. Cochrane
1894.	*Cornelius Kollock	A. B. Miles J. B. S. Holmes	*W. E. B. Davis	Hardin P. Cochrane
1895.	*Louis McLane Tiffany	Ernest S. Lewis *Manning Simons	*W. E. B. Davis	*Richard Douglas
1896.	Ernest S. Lewis	Joseph Taber Johnson *Richard Douglas	*W. E. B. Davis	*A. M. Cartledge
1897.	*George Ben Johnston	W. E. Parker Floyd W. McRae	*W. E. B. Davis	*A. M. Cartledge
1898.	*Richard Douglas	*H. H. Mudd James A. Goggans	*W. E. B. Davis	*A. M. Cartledge
1899.	Joseph Taber Johnson	F. W. Parham *W. L. Robinson	*W. E. B. Davis	*A. M. Cartledge
1900.	*A. M. Cartledge	*Manning Simons W. P. Nicolson	*W. E. B. Davis	W. D. Haggard
1901.	*Manning Simons	George H. Noble L. C. Bosher	W. D. Haggard	Floyd W. McRae
1902.	*W. E. B. Davis	J. Wesley Bovée J. W. Long	W. D. Haggard	Floyd W. McRae
1903.	J. Wesley Bovée	Christopher Tompkins Bacon Saunders	W. D. Haggard	Floyd W. McRae
1904.	Floyd W. McRae	George S. Brown J. Shelton Horsley	W. D. Haggard	Charles M. Rosser
1905.	Lewis C. Bosher	J. D. S. Davis I. S. Stone	W. D. Haggard	Charles M. Rosser
1906.	George H. Noble	Stuart McGuire E. Denegre Martin	W. D. Haggard	Charles M. Rosser
1907.	Howard A. Kelly	Rufus E. Fort Hubert A. Royster	W. D. Haggard	Charles M. Rosser
1908.	F. W. Parham	Henry D. Fry W. F. Westmoreland	W. D. Haggard	Stuart McGuire
1909.	Stuart McGuire	John Young Brown R. S. Cathcart	W. D. Haggard	Wm. S. Goldsmith
1910.	W. O. Roberts	Joseph C. Bloodgood Lewis C. Morris	W. D. Haggard	Wm. S. Goldsmith
1911.	Rudolph Matas	Guy L. Hunner J. Garland Sherrill	W. D. Haggard	Wm. S. Goldsmith
1912.	J. M. T. Finney	J. E. Thompson W. P. Carr	W. D. Haggard	Wm. S. Goldsmith
1913.	John Young Brown	*Ap Morgan Vance Lomax Gwathmey	W. D. Haggard	Le Grand Guerry
1914.	John W. Long	A. C. Scott James F. Mitchell	W. D. Haggard	Le Grand Guerry
1915.	Bacon Saunders	Thomas S. Cullen S. M. D. Clark	W. D. Haggard	Le Grand Guerry
1916.	Thomas S. Cullen	Robert S. Hill Willard Bartlett	W. D. Haggard	Le Grand Guerry
1917.	W. D. Haggard	J. Ernest Stokes F. R. Hagner	H. A. Royster	Le Grand Guerry

LIST OF MEETING PLACES, WITH DATES AND PRESIDING OFFICERS

1888.	Birmingham,	William D. Haggard
1889.	Nashville,	Hunter H. McGuire
1890.	Atlanta,	George J. Engelmann
1891.	Richmond,	Lewis S. McMurtry
1892.	Louisville,	J. McFadden Gaston
1893.	New Orleans,	Bedford Brown
1894.	Charleston,	Cornelius Kollock
1895.	Washington,	Louis McLane Tiffany
1896.	Nashville,	Ernest S. Lewis
1897.	St. Louis,	George Ben Johnston
1898.	Memphis,	Richard Douglas
1899.	New Orleans,	Joseph Taber Johnson
1900.	Atlanta,	A. M. Cartledge
1901.	Richmond,	Manning Simons
1902.	Cincinnati	W. E. B. Davis
1903.	Atlanta,	J. Wesley Bovée
1904.	Birmingham,	Floyd W. McRae
1905.	Louisville,	Lewis C. Bosher
1906.	Baltimore,	George H. Noble
1907.	New Orleans,	Howard A. Kelly
1908.	St. Louis,	F. W. Parham
1909.	Hot Springs,	Stuart McGuire
1910.	Nashville,	William O. Roberts
1911.	Washington,	Rudolph Matas
1912.	Old Point,	John M. T. Finney
1913.	Atlanta,	John Young Brown
1914.	Asheville,	John W. Long
1915.	Cincinnati,	Bacon Saunders
1916.	White Sulphur Springs,	Thomas S. Cullen

HONORARY MEMBERS

1894.—Foy, George	Dublin.
Founder.—Herff, Ferdinand	San Antonio, Texas.
1894.—Jacobs, Charles	Brussels.
1889.—Johnson, Joseph Taber	Cherrydale, Va.
1910.—Jones, Robert	Liverpool.
1910.—Lane, Arbuthnot	London.
1894.—Martin, A.	Berlin.
1902.—Maury, Richard B.	Memphis, Tenn.
1894.—Morisani, O.	Naples.
1910.—Morison, Rutherford	New-Castle-on-Tyne.
1910.—Moynihan, B. G. A.	Leeds.
1910.—Myles, Thomas, Sir	Dublin.
1894.—Pozzi, S.	Paris.
1910.—Robson, Mayo	London.
Founder.—Schilling, Nicholas	Cedar Bayou, Texas.
1910.—Stiles, H. J.	Edinburgh.
1907.—*Tiffany, L. M.	Baltimore, Md.

* Deceased.

HONORARY FELLOWS

Founder.—CUNNINGHAM, RUSSELL M., M.D. Surgeon to the Pratt Mines Hospital, Ensley, Ala.

Founder.—DAVIS, JOHN D. S., M.D., LL.D. Professor in the Post-graduate School of Medicine of the University of Alabama; Surgeon to the Hillman Hospital; ex-President of the Jefferson County Medical Society; Vice-president of the American Association of Obstetricians and Gynecologists, 1909. *Vice-President,* 1905. Avenue G and Twenty-first St., Birmingham, Ala.

Founder.—GOGGANS, JAMES A., M.D. Ex-President of the Tri-State Medical Society of Alabama, Georgia and Tennessee; Senior Councillor of the Medical Association of the State of Alabama; Fellow of the British Gynecological Society. *Vice-President,* 1898. Alexander City, Ala.

Founder.—*JOHNSTON, GEORGE BEN, M.D. Formerly Consulting Surgeon to the Richmond Eye, Ear and Throat Infirmary; ex-President of the Richmond Academy of Medicine and Surgery; ex-President of the Medical Society of Virginia; Member of the American Association of Obstetricians and Gynecologists, and First Vice-President, 1896; Member of the Ninth International Medical Congress; Member of the American Surgical Association; Professor of the Practice of Surgery and Clinical Surgery in the Medical College of Virginia and formerly Professor of Anatomy; Surgeon to the Old Dominion Hospital; Consulting Surgeon to the City Free Dispensary. *Vice-President,* 1892; *President,* 1897. 407 East Grace St., Richmond, Va.

Founder.—LONG, JOHN WESLEY, M.D., F.A.C.S. Emeritus Professor of Gynecology and Pediatrics in the Medical College of Virginia; formerly Gynecologist to the Old Dominion Hospital and the Richmond City Dispensary; Member, ex-Orator and ex-Vice-President of the Medical Society of the State of North

* Deceased.

Carolina; President of the North Carolina Surgical Club; Major, Medical Officers Reserve Corps, U. S. A. *Vice-President*, 1902. *President*, 1914. Greensboro, N. C.

Founder.—Stone, Isaac Scott, M.D., Sc.D. Professor of Gynecology, Georgetown University; Gynecologist to Columbia and Georgetown University Hospitals; Fellow of the American Gynecological Society; Fellow of the Royal Society of Medicine, London, England. *Vice-President*, 1905. 1618 Rhode Island Avenue, Washington, D. C.

Founder.—Taylor, Hugh M., M.D. Emeritus Professor of the Practice of Surgery and Clinical Surgery, Medical College of Virginia; formerly Surgeon to the Virginia Hospital; ex-President of the Virginia Board of Medical Examiners. 6 North Fifth Street, Richmond, Va.

FELLOWS

1908.—Abell, Irvin, M.D. Professor of Principles and Practice of Surgery and Clinical Surgery, Medical Department, University of Louisville; Visiting Surgeon, University Hospital, Louisville City Hospital, and St. Mary and Elizabeth Hospital. 1228 Second St., Louisville, Ky.

1911.—Allen, Carroll W., M.D. 1312 Louisiana Ave., New Orleans, La.

1915.—Baer, William Stevenson, F.A.C.S., A.B., M.D. Associate Professor, Orthopedic Surgery, Johns Hopkins University; Associate in Orthopedic Surgery in charge of Orthopedic Department, Johns Hopkins Hospital; Consulting Orthopedic Surgeon, Home for Incurables; Surgeon-in-chief, Children's Hospital; Visiting Orthopedic Surgeon, Union Protestant Infirmary, Hospital for Women of Maryland, and Robert Garrett Hospital for Children; Consulting Orthopedic Surgeon, Cambridge Hospital, Cambridge, Md. 4 West Madison Street, Baltimore, Md.

1914.—Bailey, Fred. Warren, B.Sc., M.D. Assistant Professor of Surgery, St. Louis University School of Medicine; Associate Chief Surgeon, St. John's Hospital; Visiting Gynecologist, St. Louis City Sanitarium. 633 Metropolitan Building, St. Louis, Mo.

1905.—Baker, James Norment, M.D. Visiting Surgeon, St. Margaret's Hospital; Secretary of the Medical Association of the State of Alabama. 719 Madison Avenue, Montgomery, Ala.

*1894.—Baldridge, Felix E., M.D., Huntsville, Ala.

1916.—Balfour, Donald Church, M.D. Surgeon to St. Mary's Hospital. Rochester, Minn.

1903.—Balloch, Edward A., M.D. Professor of Surgery, Medical Department of Howard University; Surgeon to Freedmen's Hospital; Member American Academy of Medicine. 1511 Rhode Island Avenue, N. W., Washington, D. C.

* Deceased.

1916.—Barksdale, John W., M.D. Winona, Miss.

1908.—Barr, Richard Alexander, M.D. Professor of Surgery and Clinical Surgery, Medical Department of Vanderbilt University; late Major of First Tennessee Infantry, U. S. A. First National Bank Building, Nashville, Tenn.

1905.—Barrow, David, M.D. Ex-President Kentucky State Medical Society. 148 Market Street, Lexington, Ky.

1905.—Bartlett, Willard, M.D. Surgeon to St. Anthony's Hospital. *Vice-President*, 1916. 4257 Washington Boulevard, St. Louis, Mo.

1901.—Baughman, Greer, M.D. Professor of Obstetrics, Medical College of Virginia; Visiting Obstetrician to the Virginia Hospital, Memorial Hospital, and Stuart Circle Hospital, Richmond, Virginia. 26 North Laurel Street.

1907.—Bevan, Arthur Dean, M.D. Professor of Surgery, Rush Medical College, University of Chicago. 100 State Street, Chicago, Ill.

1916.—Biggs, Montgomery Herman, M.D. Surgeon to Rutherford Hospital; Chief Surgeon C. C. and O. Railway. Rutherfordton, N. C.

1916.—Black, William T., M.D. Exchange Building, Memphis, Tenn.

1908.—Blair, Vilray Papin, A.M., M.D. Metropolitan Building, St. Louis, Mo.

1906.—Bloodgood, Joseph Colt, M.D. Associate Professor of Surgery, Johns Hopkins University; Associate Surgeon, Johns Hopkins Hospital; Surgeon to the Union Protestant Infirmary; Chief Surgeon to St. Agnes' Hospital. *Vice-President*, 1910. 904 North Charles Street, Baltimore, Md.

1901.—Boldt, Hermann J., M.D. Gynecologist to Post-Graduate Hospital, St. Mark's Hospital, German Polyclinic; Consulting Gynecologist to the Beth Israel Hospital and to St. Vincent's Hospital; Professor of Gynecology, Post-Graduate Medical School; Member of the Gynecological Society of Germany; Fellow of the American Gynecological Society; Fellow of the Royal Society of Medicine (London); ex-President of the New York Obstetrical Society; of the German Medical Society of New York; of the Section of Obstetrics of the New York Academy of Medicine. 39 East Sixty-first Street, New York, N. Y.

1902.—Bonifield, Charles Lybrand, M.D. Professor of Clinical Gynecology, Medical College of Ohio (Medical

Department University of Cincinnati); Member American Association of Obstetricians and Gynecologists; ex-President, Cincinnati Academy of Medicine; ex-President, Cincinnati Obstetrical Society. 409 Broadway, Cincinnati, Ohio.

1911.—Borden, W. C., M.D. Professor of Surgery and Dean, George Washington University; Surgeon-in-Chief to the George Washington University Hospital. 1801 California St., Washington, D. C.

1890.—Bosher, Lewis Crenshaw, M.D. Professor of Practice of Surgery and Clinical Surgery in the Medical College of Virginia; Visiting Surgeon to the Memorial Hospital; Member of American Surgical Association; Member of the American Association of Obstetricians and Gynecologists; Member of Association of American Anatomists; Member of American Urological Association; ex-President of Richmond Academy of Medicine and Surgery. *Vice-President*, 1901; *President*, 1905. 422 East Franklin Street, Richmond, Va.

1895.—Bovée, J. Wesley, M.D. Fellow of American Gynecological Society; President of Washington Obstetrical and Gynecological Society; ex-President Medical and Surgical Society of the District of Columbia; Honorary Fellow of Medical Society of Virginia; Professor of Gynecology of George Washington University, Washington, D. C.; Gynecologist to Providence, Columbia, and George Washington University Hospitals; Consulting Physician to St. Ann's Infant Asylum, and Attending Gynecologist to St. Elizabeth's Hospital for the Insane, Washington, D. C. *Vice-President*, 1902; *President*, 1903; Member of *Council*, 1903–1906. The Rochambeau, Washington, D. C.

1905.—Brown, John Young, M.D. Formerly Surgeon-in-Charge, St. Louis City Hospital; President of the American Association of Obstetricians and Gynecologists, 1906. *Vice-President*, 1909; *President*, 1913. Metropolitan Building, St. Louis, Mo.

1908.—Bryan, Robert C., M.D. Professor of Genito-urinary Diseases, Medical College of Virginia; Visiting Surgeon to the Virginia Hospital. First and Main Streets, Richmond, Va.

1910.—Bryan, W. A., M.D. Professor of Surgery and Clinical Surgery, Vanderbilt University; Professor of Oral Surgery, Dental Department, Vanderbilt University. 146 Eighth Avenue, N., Nashville, Tenn.

1913.—Buist, A. Johnston, M.D. Professor of Gynecology, Medical College of the State of South Carolina; Visiting Gynecologist, Roper Hospital. 279 Meeting Street, Charleston, S. C.

1907.—Burch, Lucius E., M.D. Professor of Gynecology, Vanderbilt University, Medical Department; Gynecologist, Nashville City Hospital; Captain and Surgeon, N. G. S. T. 706 Church Street, Nashville, Tenn.

1900.—Byford, Henry T., M.D. Professor of Gynecology and Clinical Gynecology, College of Physicians and Surgeons (University of Illinois); Professor of Gynecology, Post-Graduate Medical School of Chicago; Surgeon to Woman's Hospital, etc. Peoples Gas Bldg., Chicago, Ill.

1902.—Caldwell, C. E., A.M., M.D. Clinical Professor of Surgery and Associate Professor of Surgical Anatomy in Medical Department, University of Cincinnati; Surgeon to Cincinnati General Hospital. "The Livingstone," Seventh and Race Streets, Cincinnati, Ohio.

1910.—Caldwell, Robert, M.D. Professor of Surgical Anatomy, Vanderbilt University; ex-President of Nashville Academy of Medicine. 315 Jackson Building, Nashville, Tenn.

1906.—Cannady, John Egerton, M.D. Former Surgeon-in-Charge to Sheltering Arms Hospital, Hansford, W. Va.; Fellow of the American Association of Obstetricians and Gynecologists; Non-resident Honorary Fellow of the Kentucky State Medical Society; Fellow of the West Virginia Medical Association, Virginia Medical Society, Tri-State Society of Virginia and the Carolinas, American Association of Railway Surgeons. 100 Capitol Street, Charleston, W. Va.

1904.—Carothers, Robert, M.D. Professor of Clinical Surgery, Medical College of Ohio, Medical Department, Cincinnati University; Surgeon to the Good Samaritan Hospital; 413 Broadway, Cincinnati, Ohio.

1903.—Carr, William P., M.D. Professor of Physiology and Professor of Clinical Surgery, Columbian University; Surgeon to the Emergency Hospital and University Hospital; Consulting Surgeon to the Washington Asylum Hospital and the Government Hospital for the Insane, Washington, D. C. *Vice-President*, 1912. 1418 L Street, N. W., Washington, D. C.

1899.—Cathcart, R. S., M.D. Professor of Abdominal Surgery, Medical College of the State of South Carolina; Surgeon-in-chief, Roper Hospital, Charleston, S. C.; Surgeon,

Atlantic Coast Line Railway, Charleston Consolidated Railway and Lighting Co., The Citadel—the Military College of South Carolina, and the Confederate Home College, Charleston, S. C. *Vice-President,* 1909. 66 Hasell Street, Charleston, South Carolina.

1907.—Clark, John G., M.D. Professor of Gynecology, University of Pennsylvania; Gynecologist-in-Chief, University Hospital. 2017 Walnut Street, Philadelphia, Penna.

1907.—Clark, S. M. D., M.D. Professor of Gynecology and Clinical Obstetrics, Tulane Medical Department; Visiting Surgeon, Charity Hospital. 1435 Harmony Street, New Orleans La.

1893.—Cocram, Henry S., M.D. 108 Baronne Street, New Orleans, La.

1908.—Coffey, Robert C., M.D. Secretary, Oregon State Board of Medical Examiners; Councillor, Oregon State Medical Association. Stevens Building, Portland, Oregon.

1909.—Cole, Herbert Phalon, M.D. Instructor in Gynecology and Clinical Diagnosis, Medical Department of the University of Alabama; Gynecologist to City Hospital of Mobile. 202 Conti Street, Mobile, Ala.

1916.—Coleman, Claude C., M.D. Professor of Oral Surgery and Anesthesia, Associate in Clinical Surgery, Medical College of Virginia; Attending Surgeon to Memorial and Virginia Hospitals. 200 W. Grace Street, Richmond, Va.

1902.—Coley, William B., M.D. Clinical Lecturer on Surgery, College of Physicians and Surgeons; Assistant Surgeon in Hospital for Ruptured and Crippled; Attending Surgeon to General Memorial Hospital; Fellow of the American Surgical Association, New York Surgical Society, and New York Academy of Medicine. 40 East Forty-first Street, New York, N. Y.

1914.—Cousins, William Lewis, M.D. Surgeon-in-Chief, St. Barnabas' Hospital; Consulting Surgeon, Maine General Hospital. 231 Woodford Street, Portland, Maine.

1916.—Cowden, Charles N., M.D. Surgeon to City Hospital; Gynecologist to St. Thomas' Hospital. Hitchcock Bldg., Nashville, Tenn.

1907.—Crawford, Walter W., M.D. Ex-President Southern Medical Association; ex-President Perry County Medical Society; ex-President Mississippi State Medical Association; Surgeon to South Mississippi Infirmary. Hattiesburg, Miss.

1902.—Crile, George W., M.D. Professor of Surgery, The School of Medicine of Western Reserve University; Visiting Surgeon to Lakeside Hospital. 1021 Prospect Avenue, Cleveland, Ohio.

1908.—Crisler, Joseph Augustus, M.D. Professor of Anatomy and Operative Surgery, College of Physcians and Surgeons, Memphis, Tennessee; Lecturer on Minor Surgery, Medical Department, University of Mississippi; ex-Member of Mississippi State Board of Health and Medical Examiners; ex-Vice-President Mississippi State Medical Association and Tri-State Medical Association. Memphis Trust Building, Memphis, Tenn.

1906.—Cullen, Thomas Stephen, M.D. Associate Professor of Gynecology, Johns Hopkins University; Associate in Gynecology, Johns Hopkins Hospital; Consultant in Abdominal Surgery, Church Home and Infirmary. Fellow of the American Gynecological Society; Honorary Member to La Societa Italiana Ostettricia Ginecologia, Rome; Corresponding Member of the Gesellschaft f. Geburtshülfe, Leipzig. *Vice-President*, 1915; *President*, 1916. 20 E. Eager Street, Baltimore, Md.

1907.—Danna, Joseph A., M.D. Chief Visiting Surgeon, Charity Hospital. Charity Hospital, New Orleans, Louisiana.

1910.—Davis, John Staige, M.D. Instructor in Surgery, Johns Hopkins University; Assistant Surgeon to the Out-Patient Department of Johns Hopkins Hospital; Visiting Surgeon to the Union Protestant Infirmary, Visiting Surgeon to the Church Home and infirmary. 1200 Cathedral Street, Baltimore, Md.

1900.—Deaver, John B., M.D. Surgeon-in-Chief to the German Hospital. 1634 Walnut Street, Philadelphia.

1896.—Doughty, W. H., M.D. Professor of Special Surgery and Surgical Pathology, Medical Department, University of Georgia; Chief Surgeon to Charleston and Western Carolina Railroad. 822 Greene Street, Augusta, Ga.

1914.—Downes, William Augustus, M.D. Assistant Professor of Clinical Surgery, Columbia University, College of Physicians and Surgeons; Attending Surgeon, General Memorial and Babies' Hospitals; Associate Attending Surgeon, St. Luke's Hospital and Hospital for Ruptured and Crippled. 37 West Seventy-first Street, New York, N. Y.

1916.—Du Bose, Francis Goodwin, M.D. Surgeon-in-Charge of Vaughan Memorial Hospital. Selma, Ala.

1890.—Earnest, John G., M.D. Professor of Clinical Gynecology, College of Physicians and Surgeons; formerly Professor of Gynecology, Southern Medical College; Visiting Gynecologist to the Grady Hospital. 828 Candler Building, Atlanta, Ga.

1907.—Elbrecht, Oscar Herman, M.D. Visiting Surgeon, St. Louis City Hospital; Consulting Surgeon to St. Louis Maternity, Bethesda and Missouri Pacific Railroad Hospitals. 423 Metropolitan Building, St. Louis, Mo.

1891.—Elkin, William Simpson, M.D. Professor of Operative and Clinical Surgery, Atlanta College of Physicians and Surgeons; ex-President of the Atlanta Society of Medicine; Surgeon to Grady Hospital. 27 Luckie St., Atlanta, Ga.

1904.—Finney, J. M. T., M.D. Associate Professor of Surgery, Johns Hopkins University; Surgeon to Out-patients, Johns Hopkins Hospital. *President,* 1912. 1300 Eutaw Place, Baltimore, Md.

1901.—Fort, Rufus E., M.D. Chief Surgeon, Nashville Terminal Company; Surgeon to Tennessee Central Railroad; Surgeon to Nashville Hospital; *Vice-President,* 1907. 209 Seventh Avenue, N., Nashville, Tenn.

1905.—Frank, Louis, M.D. Professor of Surgery and Clinical Surgery, University of Louisville; Visiting Surgeon to Louisville City Hospital. 400 Atherton Building, Louisville, Ky.

1916.—Frazier, Charles H., M.D. Professor of Clinical Surgery, University of Pennsylvania. 1724 Spruce Street, Philadelphia, Pa.

1902.—Freiberg, Albert H., M.D. Professor of Orthopedic Surgery in the Medical College of Ohio, Medical Department of the University of Cincinnati; Orthopedic Surgeon to the Cincinnati Hospital and to the Jewish Hospital of Cincinnati. 19 West Seventh Street, Cincinnati, Ohio.

1913.—Gibbon, R. L., M.D. Charlotte, N. C.

1900.—Goldsmith, W. S., M.D. *Treasurer,* 1909–1912. 262 Jackson Street, Atlanta, Ga.

1892.—Grant, Horace H., M.D. Professor of Surgery in the Hospital College of Medicine; Surgeon to the Louisville City Hospital. 328 Atherton Building, Louisville, Ky.

1905.—Guerry, Le Grand, M.D. Surgeon, Columbia Hospital. *Treasurer.* Columbia, S. C.

1896.—Gwathmey, Lomax, M.D. Attending Gynecologist to St. Vincent's Hospital and Dispensary, *Vice-President*, 1913. Norfolk, Va.

1896.—Haggard, William David, M.D. Professor of Surgery and Clinical Surgery, Vanderbilt University. Surgeon to St. Thomas' Hospital, Vanderbilt and City Hospitals. *Treasurer*, 1900; *Secretary*, 1901–1916; *President*. 706 Church Street, Nashville, Tenn.

1910.—Hagner, Francis Randall, M.D. Professor of Genito-urinary Surgery, George Washington University; Attending Genito-urinary Surgeon, George Washington University Hospital; Attending Surgeon, Garfield Memorial Hospital. *Vice-President*. The Farragut, Washington, D. C.

1892.—Hall, Rufus Bartlett, A.M., M.D. Professor of Clinical Gynecology in the Miami Medical College; Gynecologist to the Presbyterian Hospital; ex-President of the Cincinnati Obstetrical Society; ex-President of the American Association of Obstetricians and Gynecologists; Fellow of British Gynecological Society. 628 Elm Street, Cincinnati, O.

1910.—Hanes, Granville S., M.D. Professor of Surgery of the Rectum and Intestinal Diseases, Medical Department of the University of Louisville; Surgeon to the Louisville City Hospital. The Atherton Building, Louisville, Ky.

1901.—Hazen, Charles M., M.D. Professor of Physiology, Medical College of Virginia. Bon Air (Richmond), Va.

1896.—Heflin, Wyatt, M.D. Ex-President of the Jefferson County Medical Society. Birmingham, Ala.

1905.—Hendon, George A., M.D. Professor of Surgery and Clinical Surgery, University of Louisville. 968 Baxter Avenue, Louisville, Ky.

1889.—Hill, Robert Somerville, M.D. Gynecologist to the Laurel Hill Hospital; Senior Councillor of the Medical Association of the State of Alabama; ex-President of the Montgomery County Medical and Surgical Association; former Surgeon of the Second Regiment, Alabama State Militia. *Vice-President*, 1916. Montgomery, Ala.

1913.—Hodgson, Fred G., M.D. Assistant in Orthopedics, Atlanta Medical College; Orthopedic Surgeon, Wesley Memorial Hospital and MacVicar Hospital of Spelman Seminary; Junior Orthopedic Surgeon, Grady Memorial Hospital. 72 West Peachtree Street, Atlanta, Ga.

1911.—Hogan, Edgar P., M.D. Associate Professor of Gynecology and Abdominal Surgery, Graduate School of Medicine of the University of Alabama; Resident Surgeon and Gynecologist to the Hillman Hospital. 412–14 Empire Building, Birmingham, Ala.

1906.—Holden, Gerry R., M.D. Formerly House Surgeon, Roosevelt Hospital, New York City; formerly Resident Gynecologist, Johns Hopkins Hospital, and Assistant in Gynecology, Johns Hopkins Medical School. 223 West Forsyth Street, Jacksonville, Fla.

1900.—Horsley, John Shelton, M.D. Surgeon-in-Charge of St. Elizabeth's Hospital. *Vice-President,* 1904. 617 West Grace Street, Richmond, Va.

1896.—Hundley, J. Mason, M.D. Associate Professor of Diseases of Women and Children, University of Maryland; President Clinical Society of Baltimore. 1009 Cathedral Street, Baltimore, Md.

1903.—Hunner, Guy Le Roy, M.D. Associate in Gynecology, Johns Hopkins University; Professor of Genito-urinary Surgery, Woman's Medical College of Baltimore; Gynecologist-in-Chief, St. Agnes' Hospital; Visiting Gynecologist, Church Home and Hebrew Hospital, Baltimore, Frederick City Hospital, Frederick, Md., and Hagerstown Hospital, Hagerstown, Md.; Consulting Gynecologist, Brattleboro Memorial Hospital, Brattleboro, Vt. *Vice-President,* 1911. 2305 St. Paul Street Baltimore, Md.

1900.—Ill, Edward Joseph, M.D. Surgeon to the Woman's Hospital; Medical Director, St. Michael's Hospital; Gynecologist and Supervising Obstetrician, St. Barnabas' Hospital; Consulting Gynecologist to German Hospital and Beth Israel Hospital of Newark, N. J., to All Souls' Hospital, Morristown, N. J., and to Mountain Side Hospital, Montclair, N. J.; Vice-President from New Jersey to Pan-American Congress of 1893. 1002 Broad Street, Newark, N. J.

1912.—Jackson, William R., M.D. Professor of Surgery to the Medical Department of the University of Alabama; Consulting Surgeon to the City Hospital and Southern Infirmary, Mobile, Ala. 164 St. Michael Street, Mobile, Ala.

1908.—Jonas, Ernst, M.D. Clinical Professor of Surgery, Medical Department, Washington University; Chief of Surgical Clinic, Washington University Hospital; Gynecologist to the Jewish Hospital; Surgeon to the Martha Parsons Hospital

for Children; Fellow of the American Association of Obstetricians and Gynecologists. 4495 Westminster Place, St. Louis, Mo.

1910.—Jones, Edward Groves, A.B., M.D. Professor of Surgery, Medical Department, Emory University (Atlanta Medical College); Surgeon to Grady Memorial Hospital, Georgia Baptist Hospital and Wesley Memorial Hospital. 714 Hurt Building, Atlanta, Ga.

1902.—Jordan, William Mudd, M.D. 501 Woodward Building, Birmingham, Ala.

1912.—Judd, Edward Starr, M.D. Surgeon to St. Mary's Hospital, Rochester, Minn.

1890.—Kelly, Howard Atwood, M.D. Founder of Kensington Hospital, Philadelphia; Associate Professor of Obstetrics, University of Pennsylvania, 1888–89; Professor of Gynecology and Obstetrics, Johns Hopkins University, 1889–99; Professor of Gynecology, Johns Hopkins University; Gynecologist-in-Chief to Johns Hopkins Hospital; Member Associé Etranger de la Société Obstétricale et Gynécologique de Paris; Correspondirendes Mitglied der Gesellschaft f. Geburtshülfe zu Leipzig; Honorary Fellow, Edinburgh Obstetrical Society, Royal Academy of Medicine (Ireland), and British Gynecological Society; Member of Washington Academy of Sciences; Fellow of the American Gynecological Society. *President*, 1907. 1418 Eutaw Place, Baltimore, Maryland.

1907.—Kirchner, Walter C. G., M.D. Formerly Surgeon-in-Charge, St. Louis City Hospital. 508 Metropolitan Building, St. Louis, Mo.

1899.—Kohlman, William, M.D. 3500 Prytania Street, New Orleans, La.

1913.—LaRoque, G. Paul, M.D. Associate Professor of Surgery, Medical College of Virginia; Surgeon, Memorial Hospital. 501 East Grace Street, Richmond, Va.

1914.—Landry, Lucian, M.D. Assistant Demonstrator in Operative Surgery and Instructor in Clinical Surgery, Tulane University of Louisiana, School of Medicine; Junior Surgeon, Touro Infirmary; Visiting Surgeon, Charity Hospital. 2255 St. Charles Avenue, New Orleans, La.

1916.—Law, Arthur Ayer, M.D. Associate Professor of Surgery, University of Minnesota Medical School and Mayo Foundation; Major, M. O. R. C. and Director, University of Minnesota Base Hospital, No. 26; Surgeon, University of Minne-

sota Hospital and University Hospital; Assistant Chief of University Hospital. Syndicate Building, Minneapolis, Minn.

1894.—Leigh, Southgate, M.D. Visiting Surgeon to St. Vincent's and Norfolk Protestant Hospitals; First Vice-President of Medical Society of Virginia, 1899-1900. 147 Granby Street, Norfolk.

1912.—Lewis, Bransford, M.D. Century Building, St. Louis, Mo.

1914.—Lewis, Dean, A.B., M.D. Associate Professor of Surgery, Rush Medical College; Attending Surgeon, Presbyterian Hospital; Consulting Surgeon, Anne W. Durand Hospital of the Memorial Institute for Infectious Diseases. 122 South Michigan Avenue, Chicago, Ill.

1893.—Lewis, Ernest S., M.D. Professor of Gynecology, Medical Department of Tulane University. *Vice-President*, 1895; *President*, 1896; *Member of Council*, 1896–1903. 124 Baronne Street, New Orleans, La.

1900.—Lloyd, Samuel, M.D. Professor of Surgery, New York Post-Graduate Medical School; Attending Surgeon to the Post-Graduate Hospital and St. Francis' Hospital, and Consulting Surgeon to the Benedictine Sanitarium at Kingston, N. Y. 12 West Fiftieth Street, New York, N. Y.

1904.—Lupton, Frank A., M.D. 816 Woodward Building, Birmingham, Ala.

1902.—McAdory, Wellington P., M.D. Surgeon to Hillman Hospital. Birmingham, Ala.

1895.—McGannon, M. C., M.D. Professor of Surgery and Clinical Surgery, Medical Department, Vanderbilt University; Chief Surgeon, Woman's Hospital. 118 Eighth Avenue, N., Nashville, Tenn.

1911.—McGlannan, Alexius, M.D. Associate Professor of Surgery, College of Physicians and Surgeons, Baltimore. 114 West Franklin St., Baltimore, Md.

1893.—McGuire, Stuart, M.D. Professor of the Principles of Surgery and Clinical Surgery, University College of Medicine; Surgeon-in-Charge, St. Luke's Hospital; Visiting Surgeon, Virginia Hospital; Consulting Surgeon, Virginia Home for Incurables. *Vice-President*, 1906; *Treasurer*, 1908; *President*, 1909. 518 East Grace Street, Richmond, Va.

1891.—McGuire, W. Edward, M.D. Professor of Gynecology, University College of Medicine; Gynecologist to the Virginia Hospital. 411 East Grace Street, Richmond, Va.

1888.—McMURTRY, LEWIS S., M.D., LL.D. Professor of Abdominal Surgery and Gynecology, Medical Department, University of Louisville; Surgeon to the Louisville City Hospital; ex-President of the American Medical Association; Fellow of the American Surgical Association. *President*, 1891. Suite 542, The Atherton, Louisville, Ky.

1888.—McRAE, FLOYD WILCOX, M.D. Professor of Gastro-intestinal, Rectal, and Clinical Surgery, Atlanta College of Physicians and Surgeons; Surgeon to Grady Hospital; ex-President Medical Association of Georgia; ex-Secretary of Section on Surgery and Anatomy, American Medical Association. *Vice-President*, 1897; *Treasurer*, 1901–1903; *President*, 1904. Peters Building, Atlanta, Ga.

1905.—MACLEAN, HENRY STUART, M.D. Professor of Pathology, University College of Medicine. 406 West Grace Street, Richmond, Va.

1915.—MAES, URBAN, M.D. Assistant Professor of Clinical and Operative Surgery, Tulane University of Louisiana School of Medicine; Junior Surgeon, Charity Hospital and Touro Infirmary; Senior Surgeon, New Orleans Dispensary for Women and Children. 1671 Octavia Street, New Orleans, La.

1912.—MALONE, BATTLE, M.D. 1701 Exchange Building, Memphis, Tenn.

1891.—MARCY, HENRY ORLANDO, M.D., LL.D. Ex-President of the American Medical Association; President of the Section of Gynecology, Ninth International Medical Congress, late President of the American Academy of Medicine; Corresponding Member of the Medico-Chirurgical Society of Bologna, Italy; Fellow of the American Association of Obstetricians and Gynecologists. 180 Commonwealth Avenue, Boston, Mass.

1899.—MARTIN, E. DENEGRE, M.D. Professor of Surgery, Post-Graduate Department, Tulane Medical College; Visiting Surgeon to Charity Hospital. *Vice-President*, 1906. 741 Carondelet St., New Orleans, La.

1909.—MARTIN, FRANK, M.D. Clinical Professor of Surgery at the University of Maryland. 1000 Cathedral Street, Baltimore, Md.

1913.—MARTIN, FRANKLIN H., M.D. Professor of Gynecology, Post-Graduate School; Consulting Staff, St. Luke's Hospital. Editor, *Surgery, Gynecology and Obstetrics*. 30 North Michigan Avenue, Chicago, Ill.

1904.—Mason, J. M., M.D. Gynecologist to St. Vincent's Hospital. 1915 Sixteenth Avenue, S., Birmingham, Ala.

1899.—Mastin, William M., M.D. Fellow of the American Surgical Association; Member of the American Association of Genito-urinary Surgeons; Surgeon to the Mobile City Hospital. Joachim and Conti Streets, Mobile, Ala.

1893.—Matas, R., M.D. Professor of Surgery, Medical Department of Tulane University; Fellow of the American Surgical Association. *President*, 1911. 3523 Prytania St., New Orleans, La.

1896.—Matthews, William P., M.D. Professor of Anatomy, Medical College of Virginia; Orthopedic Surgeon to the Old Dominion Hospital. Richmond, Va.

1902.—Mayo, Charles H., M.D. Attending Surgeon, St. Mary's Hospital; Fellow of American Surgical Society; ex-President, Western Surgical and Gynecological Association and of Minnesota State Medical Society. Rochester, Minn.

1899.—Michinard, P. E., M.D. 624 Gravier Street, New Orleans, La.

1888.—Miller, C. Jeff., M.D. Visiting Surgeon to Charity Hospital of Louisiana; Professor of Clinical Obstetrics and Clinical Gynecology in the Tulane University of Louisiana; Chief of the Division of Obstetrics, Gynecology and Abdominal Surgery of the Presbyterian Hospital. 1638 Joseph Street, New Orleans, La.

1916.—Miller, Edward Howe, Jr., M.D. Surgeon, Danville General Hospital; Assistant Surgeon, Southern Railway. 6 Chestnut Place, Danville, Va.

1907.—Mitchell, James F., M.D. Surgeon to Providence Hospital. *Vice-President*, 1914. 1344 Nineteenth Street, Washington, D. C.

1901.—Mixter, Samuel Jason, M.D. Surgeon, Massachusetts General Hospital; Consulting Surgeon, Massachusetts Charity Eye and Ear Infirmary; Instructor of Surgery, Harvard Medical School. 180 Marlborough St., Boston, Mass.

1910.—Moore, James E., M.D. Professor and Chief of the Department of Surgery in the College of Medicine and Surgery of the University of Minnesota; Fellow and ex-Vice-President of the American Surgical Association; Member and ex-President of the Western Surgical Association; Member and ex-Chairman of the Surgical Section of the American Medical Association; Honorary Member of the American Orthopedic Association. University of Minnesota, Minneapolis, Minn.

1911.—Moore, John Thomas, M.D. Kress Medical Bldg., Houston, Texas.

1904.—Moran, John F., M.D. Professor of Obstetrics, Georgetown University; Obstetrician to Georgetown University Hospital and Columbia Hospital for Women. 2426 Pennsylvania Avenue, Washington, D. C.

1902.—Morris, Lewis C., M.D. Professor of Anatomy and Associate Professor of Gynecology, Birmingham Medical College; Councillor of Medical Association, State of Alabama. *Vice-President*, 1910. 1203–6 Empire Building, Birmingham, Ala.

1900.—Morris, Robert Tuttle, M.D. Professor of Surgery, New York Post-Graduate Medical School and Hospital. 616 Madison Avenue, New York, N. Y.

1901.—Mullally, Lane, M.D. Professor of Obstetrics and Diseases of Children, Medical College, State of South Carolina; Visiting Physician in Obstetrics and Pediatrics, Roper Hospital. Charleston, S. C.

1916.—Murphy, Fred Towsley, M.D. Professor of Surgery, Washington University Medical School; Surgeon-in-Chief to the Barnes and St. Louis Children's Hospitals; Consulting Surgeon to the St. Louis City Hospital. Euclid Avenue and Kingshighway, St. Louis, Mo.

1916.—Newell, E. Dunbar, M.D. Surgeon to the Newell and Newell Sanitarium; Consulting Surgeon to the Erlanger Hospital. Chattanooga, Tenn.

1889.—Nicolson, William Perrin, M.D. Professor of Anatomy and Clinical Surgery, Atlanta College of Physicians and Surgeons; Visiting Surgeon to Grady Hospital; Senior Surgeon to Wesley Memorial Hospital; Senior Surgeon, St. Joseph's Hospital. *Vice-President*, 1900. Healey Building, Atlanta, Ga.

1890.—Noble, George H., M.D. Dean and Professor of Abdominal Surgery and Clinical Gynecology, Atlanta School of Medicine; Gynecologist of Grady Hospital; Senior Gynecologist, Wesleyan Memorial Hospital, Atlanta; Fellow of the American Gynecological Association and the American Association of Obstetricians and Gynecologists; ex-President of the Medical Association of Georgia; ex-Secretary of the Section of Obstetrics, American Medical Association. *Vice-President*, 1901; *President*, 1906. 131 South Pryor Street, Atlanta, Ga.

1911.—Norris, Henry, M.D. Rutherfordton, N. C.

1901.—Ochsner, A. J., M.D. Adjunct Professor of Clinical Surgery, College of Physicians and Surgeons; Surgeon-in-Chief, Augustana and St. Mary's Hospital. 2106 Sedgwick Street, Chicago, Ill.

1903.—Ochsner, Edward H., M.D. Surgeon to Augustana and St. Mary's Hospital. 2106 Sedgwick Street, Chicago, Illinois.

1904.—Oechsner, John F., M.D. Professor of Orthopedic Surgery and the Surgery of Children, Post-Graduate Medical Department, Tulane University of Louisiana; Visiting Surgeon, Charity Hospital. Macheca Building, New Orleans, Louisiana.

1902.—Oliver, John Chadwick, M.D. Dean and Professor of Operative Surgery, Miami Medical College; Surgeon to the Cincinnati, Christ, and Presbyterian Hospitals. 628 Elm Street, Cincinnati, Ohio.

1888.—Parham, F. W., M.D. Professor of Surgery in the New Orleans Polyclinic. *Vice-President*, 1899; *President*, 1908. 1429 Seventh Street, New Orleans, La.

1910.—Payne, Robert Lee, Jr., M.D. Assistant Gynecologist to St. Vincent's Hospital; Surgeon to the Southern Railway; Consulting Surgeon to the Seaboard Air Line Railway. 300 Freemason St., Norfolk, Va.

1916.—Peck, Charles H., M.D. Professor of Clinical Surgery, Columbia University; Surgeon to Roosevelt Hospital. 30 W. Fiftieth Street, New York, N. Y.

1899.—Perkins, W. M., M.D. Chief of the Clinic Chair of General Clinical and Operative Surgery, New Orleans Polyclinic; Assistant Demonstrator of Operative Surgery, Medical Department, Tulane University of Louisiana; Visiting Surgeon to the Charity Hospital. 830 Canal Street, New Orleans, La.

1908.—Peterson, Reuben, A.M., M.D. Professor of Obstetrics and Gynecology, University of Michigan; Obstetrician and Gynecologist-in-Chief to the University of Michigan Hospital. Ann Arbor, Mich.

1899.—Platt, Walter Brewster, M.D. Surgeon to the Robert Garrett Hospital for Children. 802 Cathedral Street, Baltimore, Md.

1889.—Polk, William M., M.D. Dean and Professor of Obstetrics and Gynecology, Cornell University Medical College; Gynecologist to Bellevue Hospital; Consulting Surgeon to St.

Luke's, St. Vincent's, New York Lying-in, and Trinity Hospitals; ex-President of American Gynecological Society, and New York Obstetrical Society. 310 Fifth Ave., New York.

1900.—Porter, Miles F., M.A., M.D. Surgeon to Hope Hospital; Professor of Surgery, Indiana University School of Medicine. 47 West Wayne Street, Fort Wayne, Ind.

1916.—Pryor, Stewart Wylie, M.D. Chief Surgeon to the Pryor Hospital; Chief Surgeon to C. and N. W. and L. and C. Railways; Division Surgeon to S. A. L. Railway. Chester, S. C.

1900.—Ransohoff, Joseph, M.D., F.R.C.S. Professor of Anatomy and Clinical Surgery, University of Cincinnati; Surgeon to Cincinnati, Good Samaritan, and Jewish Hospitals; Member of American Surgical Association. 19 West Seventh Street, Cincinnati, Ohio.

1911.—Reder, Francis, M.D. Surgeon, St. Louis City and St. John's Hospitals and Missouri Sanatorium. Delmar Building, St. Louis, Mo.

1890.—Reed, Charles Alfred Lee, M.D. Ex-President of the American Medical Association; Professor of Gynecology and Abdominal Surgery in the Cincinnati College of Medicine and Surgery; Surgeon to the Cincinnati Free Hospital for Women; Fellow of the American Association of Obstetricians and Gynecologists; Fellow of the British Gynecological Society; ex-Chairman of the Section on Obstetrics and Diseases of Women of the American Medical Association; Secretary-General of the Pan-American Medical Congress, 1893; Honorary Member of the Medical Society of the State of New York. 19 W. Seventh Street, Cincinnati, Ohio.

1914.—Rhodes, Goodrich Barbour, A.B., M.D. Assistant Clinical Professor of Surgery, Ohio-Miami Medical College of the University of Cincinnati; Junior Attending Surgeon, Cincinnati and Good Samaritan Hospitals and Episcopal Hospital for Children. 4 West Seventh Street, Cincinnati, Ohio.

1912.—Richardson, Edward P., M.D. Surgeon to Outpatients, Massachusetts General Hospital, and Surgeon to the Robert B. Brigham Hospital for Chronic Diseases. 224 Beacon Street, Boston, Mass.

1888.—Roberts, William O., M.D. Professor of Principles of Surgery and Clinical Surgery, Medical Department of the University of Louisville; formerly Secretary of the Surgical Section of the American Medical Association. *President*, 1910; *Vice-President*, 1889. Atherton Building, Louisville, Ky.

1901.—Robins, Charles Russell, M.D. Professor of Gynecology, Medical College of Virginia; Gynecologist to the Memorial Hospital; Surgeon to the Atlantic Coast Railroad. 8 West Grace Street, Richmond, Va.

1906.—Rogers, Carey Pegram, M.D. Chief of Surgical Staff, St. Luke's Hospital; Consulting Surgeon, Seaboard Air Line Railway. 221 Laura Street, Jacksonville, Fla.

1901.—Rogers, Mack, M.D. Professor of Anatomy, Birmingham Medical College. 212 Twentieth Street, Birmingham, Ala.

1901.—Rosser, Charles M., M.D. Professor of Surgery, Baylor University, College of Medicine; Consulting Surgeon, Parland Hospital; Attending Surgeon, Texas Baptist Memorial Sanitarium; ex-Vice-President Texas State Medical Association; Vice-President, Tri-State Society of Texas, Louisiana, and Arkansas. *Treasurer*, 1904–07. 432 Gaston Avenue, Dallas, Texas.

1899.—Royster, Hubert Ashley, A.B., M.D. Surgeon to Rex Hospital; Surgeon-in-Chief, St. Agnes' Hospital; Surgeon to Southern Railway. *Vice-President*, 1907. *Secretary*. 423 Fayetteville Street, Raleigh, N. C.

1909.—Ruffin, Kirkland, M.D. Surgeon-in-Charge of St. Christopher's Hospital. 218 York Street, Norfolk, Va.

1908.—Russell, Wm. Wood, M.D. Associate Professor of Gynecology, Johns Hopkins University; Associate in Gynecology, Johns Hopkins Hospital; Gynecologist to Union Protestant Infirmary, Baltimore. 1208 Eutaw Place, Baltimore, Md.

1893.—Saunders, Bacon, M.D. Professor of Surgery and Clinical Surgery and Dean of Faculty of Medical Department, Fort Worth University; ex-President, Texas State Medical Association. *Vice-President*, 1903; *Member of Council*, 1908; *President*, 1915. Flatiron Bldg., Fort Worth, Texas.

1907.—Scott, Arthur Carroll, M.D. Senior Surgeon, Temple Sanatorium. *Vice-President*, 1914. Temple, Texas.

1915.—Seelig, Major G., A.B., M.D. Professor of Surgery, St. Louis University School of Medicine; Attending Surgeon, Jewish and St. Louis City Hospitals; Chief of Surgical Out-Patient Department, Jewish Hospital. Wall Building, St. Louis, Mo.

1899.—Shands, A. R., M.D. Professor of Orthopedic Surgery in the Medical Department of the George Washington University and in the University of Vermont; Orthopedic

Surgeon to the George Washington University Hospital, the Emergency Hospital, and Central Dispensary; Charter Member, Washington Academy of Sciences; Member of American Orthopedic Association; and Honorary Member of Medical Society of Virginia. 901 Sixteenth Street, N. W., Washington, D. C.

1914.—Shands, Harley R., A.B., M.D. Visiting Surgeon, Mississippi State Charity and Baptist Hospitals. Century Building, Jackson, Miss.

1902.—Sherrill, J. Garland, M.D. Professor of Surgery and Clinical Surgery, University of Louisville; Consulting Surgeon to Louisville Hospital. *Vice-President*, 1911. Atherton Building, Louisville, Ky.

1900.—Simpson, Frank Farrow, M.D. Assistant Gynecologist, Mercy Hospital; Gynecologist to Out-patient Department, Mercy Hospital. Jenkins Arcade Bldg., Pittsburgh, Pa.

1913.—Simpson, James Knox, M.D. Attending Gynecologist, St. Luke's Hospital; Associate Gynecologist, Duval County Hospital, Jacksonville, Fla.

1899.—Smythe, Frank David, M.D. Gynecologist to St. Joseph's and City Hospitals; Professor of Gynecology, Didactic and Clinical, in the Memphis Hospital Medical College; ex-President West Tennessee Medical and Surgical Association; formerly Member of the Mississippi State Board of Health and State Board of Medical Examiners of Mississippi. Porter Building, Memphis, Tenn.

1916.—Souchon, Marion, M.D. House Surgeon, Hotel Dieu; Surgeon French Hospital; Assistant Professor of Clinical Surgery, Tulane University; Visiting Surgeon, Charity Hospital. Whitney Bank Bldg., New Orleans, La.

1904.—Stokes, James Ernest, M.D. *Vice-President*. Salisbury, N. C.

1894.—Talley, Dyer F., M.D. Associate Professor of Surgery, Birmingham Medical College; Attending Surgeon to Hillman Hospital; Surgeon to the Talley and McAdory Infirmary; ex-President of the Jefferson County Medical Society; Member of the Southern Medical Association; Member of the Pan-American Medical Association; Member of the Alumni Association of the Charity Hospital of Louisiana; Member of the Board of Censors of the Jefferson County Medical Society; Member of the Alabama State Board of Censors, Committee of Public Health and Examiners; Fellow of the American Association of Obstetricians and Gynecologists. 1801 Seventh Avenue, Birmingham, Ala.

1898.—Taylor, William Wood, A.B., M.D. Gynecologist to the Lucy Brinkley and the Memphis City Hospitals. 1422 Exchange Building, Memphis, Tenn.

1892. Thompson, J. E., M.D. Professor of Surgery in the University of Texas. *Vice-President*, 1912. Galveston, Tex.

1916.—Thorning, W. Burton, M.D. Chief Surgeon of the Gulf Coast Lines. Kress Building, Houston, Texas.

1908.—Torrance, Gaston, M.D. Member Surgical Staff Hillman Hospital; also the Sisters' Hospital and St. Vincent's; Fellow of the American Association of Obstetricians and Gynecologists. 328 Woodward Building, Birmingham, Ala.

1909.—Trout, Hugh Henry, M.D. Surgeon-in-Chief of Jefferson Surgical Hospital, Roanoke, Va. 1303 Franklin Road, Roanoke, Va.

1888.—Tuholske, Herman, M.D. Professor of Surgery, Medical Department, Washington University; Consulting Surgeon, St. Louis City Hospital; Surgeon to St. Louis Polyclinic Hospital. 465 North Taylor Street, St. Louis, Missouri.

1912.—Turck, Raymond C., M.D. Consolidated Building, Jacksonville, Fla.

1893.—Vander Veer, Albert, M.D. Professor of Clinical, Didactic, and Abdominal Surgery, Albany Medical College; ex-President of the American Surgical Association; ex-President of the American Association of Obstetricians and Gynecologists; ex-President of the Medical Society of the State of New York. 28 Eagle Street, Albany, New York.

1909.—Vaughan, George Tully, M.D. Professor of Surgery and Head of Department of Surgery in Georgetown University; Chief Surgeon in Georgetown University Hospital; Visiting Surgeon, Tuberculosis Hospital; Consulting Surgeon, St. Elizabeth's Hospital; Consulting Surgeon, Washington Asylum Hospital. 1718 I Street, Washington, D. C.

1891.—Walker, Edwin, M.D., Ph.D. Gynecologist to the Evansville City Hospital; ex-President Mississippi Valley Medical Association; President of the Indiana State Medical Society; Fellow of the American Association of Obstetricians and Gynecologists. 712 Upper Fourth Street, Evansville, Indiana.

1912.—Walker, George, M.D. Associate in Surgery, Johns Hopkins University. 1 E. Centre St., Baltimore, Maryland.

1911.—Waring, T. P., M.D. Savannah, Ga.

1905.—Wathen, John R., A.B., M.D. Professor of Principles and Practice of Surgery and Clinical Surgery, University of Louisville; Surgeon to St. Anthony's, Louisville City, and University of Louisville Hospitals. 628 Fourth Avenue, Louisville, Ky.

1898.—Watkins, Isaac Lafayette, M.D. Ex-President of the Montgomery County Medical and Surgical Society. Montgomery, Ala.

1907.—Watts, Stephen H., M.D. Professor of Surgery University of Virginia; Surgeon-in-Chief and Director of the University of Virginia Hospital. University of Virginia, Charlottesville, Va.

1888.—Westmoreland, Willis F., M.D. Professor of Surgery, Atlanta College of Physicians and Surgeons. *Vice-President*, 1908. 241 Equitable Building, Atlanta, Ga.

1904.—Whaley, T. P., M.D. Lecturer on Genito-urinary and Renal Surgery, Charleston Medical School; Lecturer on Diseases of Skin, Medical College of State of South Carolina; Surgeon to Sherra's Dispensary; Visiting Surgeon, Charleston City Hospital. 13 Wentworth Street, Charleston, South Carolina.

1913.—Williams, Espy Milo, M.D. Surgeon to St. Mary's Hospital. Main Street, Patterson, La.

1900.—Williams, J. Whitridge, A.B., M.D. Professor of Obstetrics, Johns Hopkins University; Obstetrician-in-Chief, Johns Hopkins Hospital; Gynecologist to the Union Protestant Infirmary. 1128 Cathedral Street, Baltimore, Md.

1907.—Willis, A. Murat, M.D. Instructor in Abdominal Surgery, Medical College of Virginia; Junior Surgeon to Memorial Hospital, Richmond, Va. 405 East Grace Street, Richmond, Va.

1913.—Windell, James Tolbert, M.D. 715 West Jefferson Street, Louisville, Ky.

1905.—Winslow, Randolph, M.D., LL.D. Professor of Surgery, University of Maryland; Chief Surgeon, University Hospital; Consulting Surgeon, Hebrew Hospital, and to Hospital for Crippled Children. 1900 Mt. Royal Terrace, Baltimore, Md.

1905.—Witherspoon, T. Casey, M.D. Formerly Professor of Operative and Clinical Surgery, Medical Department, St. Louis University; Member of American Association of Anatomists. 307 West Granite Street, Butte, Mont.

1900.—Wysor, John C., M.D. Surgeon-in-Charge, Chesapeake and Ohio Hospital. Clifton Forge, Va.

1900.—Young, Hugh H., M.D. Chief of Clinic, Genito-urinary Surgery, Johns Hopkins Hospital. 330 North Charles Street, Baltimore, Md.

1802.—Zinke, Gustav E., M.D., F.A.C.S. Professor of Obstetrics and Clinical Midwifery in the Ohio-Miami Medical College, University of Cincinnati, 1896–1916; Emeritus Professor of Obstetrics, 1916; Honorary Chief of Staff and Obstetrician and Gynecologist to the German Hospital; President of the Cincinnati Obstetric Society, 1887; President, Academy of Medicine of Cincinnati, 1894; Member and Chairman of Section on Obstetics, Gynecology and Abdominal Surgery, American Medical Association, 1914; Fellow (and Secretary) of American Association of Obstetricians and Gynecologists; Honorary Member, Jackson County Medical Society, Kansas City, Mo.; Honorary Member, Cincinnati Obstetricians and Gynecologists, 1908. 4 West Seventh Street, Cincinnati, Ohio.

CONSTITUTION

ARTICLE I

The name of this Association shall be THE SOUTHERN SURGICAL ASSOCIATION.

ARTICLE II

The object of this Association is to further the study and practice of surgery and gynecology among the profession of the Southern States.

ARTICLE III

This Association shall adopt and conform to the Code of Ethics of the American Medical Association.

ARTICLE IV

SECTION 1. Any reputable physician who practises surgery or gynecology, and who is vouched for by two members of the Association and recommended by the Council, shall be eligible to membership in this body.

SEC. 2. The honorary members shall not exceed twenty-five in number, and shall enjoy all the privileges of other members, excepting to vote or hold office, but shall not be required to pay any fee.

ARTICLE V

SECTION 1. The officers of this Association shall be a President, two Vice-Presidents, a Secretary, a Treasurer, and a Council, elected by ballot.

SEC. 2. The President and Vice-Presidents shall be elected for one year, and the President shall not be eligible for reëlection at any time; the Secretary and Treasurer, each, for five years; and the Council as provided for in the By-laws.

ARTICLE VI

SECTION 1. It shall be the duty of the President to preside at all meetings of the Association; to give the casting vote; to see that the rules of order and decorum be properly enforced in all deliberations of the Association; to sign the approved proceedings of each meeting, and to approve such orders as may be drawn upon the Treasurer for expenditures ordered by the Association.

SEC. 2. In the absence of the President the first Vice-President shall preside, and in his absence the second Vice-President shall preside.

SEC. 3. In the absence of all three, the Association shall elect one of its members to preside *pro tem.*

SEC. 4. It shall be the duty of the Secretary to keep a true and correct record of the proceedings of the meetings; to preserve all books, papers, and articles belonging to the archives of the Association; to attest all orders drawn on the Treasurer for moneys appropriated by the Association; to keep the account of the Association with its members; to keep a register of the members, with the dates of their admission and places of residence. He shall collect all moneys due from the members and pay to the Treasurer, taking his receipt for the same. He shall report such unfinished business of previous meetings as may appear on his books requiring action, and attend to such other business as the Association may direct. He shall also supervise and conduct all the correspondence of the Association, and edit the TRANSACTIONS under the direction of the Council.

SEC. 5. It shall be the duty of the Treasurer to keep a correct record of all moneys received from the hands of the Secretary, giving his receipt for the same; pay them out by order of the Association as indorsed by the President and attested by the seal in the hands of the Secretary.

SEC. 6. It shall be the duty of the President of the Association to appoint an Auditing Committee, consisting of three members of the Association, whose duty it shall be to examine the books of the Secretary and Treasurer, and report on the same on the last day of the session.

ARTICLE VII

Vacancies occurring in the offices of the Association shall be filled by appointment of the President until the next meeting. He shall also have the appointment of all committees not otherwise provided for.

ARTICLE VIII

This Constitution shall take effect immediately from the time of its adoption, and shall not be amended except by a written resolution, which shall lie over one year, and receive a vote of two-thirds of the members present.

ARTICLE IX

The membership of the Association shall be limited to two hundred.

BY-LAWS

ARTICLE I

The Southern Surgical Association shall meet annually on the Tuesday of the week preceding the week in which Christmas occurs, at 10 A.M., at such place as may be designated at the preceding meeting.

ARTICLE II

The Fellows present shall constitute a quorum for business.

ARTICLE III

The annual dues of each Fellow shall be $15, paid in advance.

ARTICLE IV

The usual parliamentary rules governing deliberative bodies shall govern the business workings of this Association.

ARTICLE V

All questions before the Association shall be determined by a majority of the votes present.

ARTICLE VI

The President shall deliver an annual address at each meeting of the Association.

ARTICLE VII

The Secretary of the Association shall receive at each annual Session a draft from the President, drawn on the Treasurer, for such sum as may be voted him by the Council, for services rendered the Association, and to this shall be added the necessary expense incurred in the discharge of his official duties.

ARTICLE VIII

It shall be the duty of the Secretary, one month prior to the annual meeting, to notify the Fellows of the Association and urge their attendance.

ARTICLE IX

The authors of papers shall notify the Secretary, six weeks prior to the meeting, of the titles of their essays, so that they may be incorporated in the preliminary programme.

ARTICLE X

COUNCIL

The Council shall consist of five members; and of those elected at the primary meeting, the first shall serve five years, the second four, and the third three, the fourth two, and the fifth one year; so that subsequently one member of the Council shall be elected annually to serve five years. No member of the Council shall be eligible for reëlection. The President and Secretary shall be *ex-officio* members of the Council.

This Council shall organize by electing a Chairman and Secretary, and shall keep a record of its proceedings.

The duties of this Council shall be—

1. To investigate applications for membership and report to the Association the names of such persons as are deemed worthy.

2. To take cognizance of all questions of an ethical, judicial, or personal nature, and upon these the decision of the Council shall be final; *provided*, that appeal may be taken from such decision of the Council to the Association, under a written protest, which protest shall be sustained by the Association, and the matter shall then be referred to a special committee, with power to take final action.

3. All motions and resolutions before the Association shall be referred to the Council without debate, and it shall report by recommendation at as early an hour as possible.

ARTICLE XI

The President shall appoint at each annual meeting a Committee of Arrangements.

ARTICLE XII

The Council shall have full power to omit from the published TRANSACTIONS, in part or in whole, any paper that may be referred to it by the Association, unless specially instructed to the contrary by the Association, which will be determined by vote.

ARTICLE XIII

The Council shall have power to drop from the roll of Fellows any member who fails to pay his dues for more than one year, or misses three consecutive sessions of the Association, or who for any reason fails to retain his good standing in his State association.

ARTICLE XIV

No paper shall be read before this Association which does not deal strictly with a subject of surgical or gynecological importance.

ARTICLE XV

No paper read before this Association shall be published in any medical journal or pamphlet for circulation, as having been read before the Association, without having received the endorsement of the Council.

ARTICLE XVI

The readings of papers shall be limited to twenty minutes each, except by permission of the Association.

MINUTES OF THE PROCEEDINGS

AT THE

TWENTY-NINTH ANNUAL MEETING

OF THE

SOUTHERN SURGICAL ASSOCIATION

HELD AT THE

GREENBRIER HOTEL

White Sulphur Springs, West Virginia

DECEMBER 11, 12 AND 13, 1916

TWENTY-NINTH ANNUAL MEETING

FIRST DAY.—*Monday, December* 11, 1916

The following named members were present:

ABELL, IRVIN.....Louisville, Ky.
BAER, W. S.....Baltimore, Md.
BARTLETT, WILLARD.....St. Louis, Mo.
BAUGHMAN, GREER.....Richmond, Va.
BLAIR, VILRAY PAPIN.....St. Louis, Mo.
BOLDT, HERMAN J.....New York, N. Y.
BONIFIELD, CHARLES L.....Cincinnati, O.
BOSHER, LEWIS CRENSHAW....Richmond, Va.
BOVÉE, J. WESLEY.....Washington, D. C.
BRYAN, ROBERT C.....Richmond, Va.
BURCH, LUCIUS E.....Nashville, Tenn.
CALDWELL, ROBERT.....Nashville, Tenn.
CANNADY, JOHN EGERTON....Charleston, W. Va.
CARR, WILLIAM P.....Washington, D. C.
CATHCART, R. S.....Charleston, S. C.
CLARK, JOHN G.....Philadelphia, Pa.
COFFEY, ROBERT C.....Portland, Ore.
COLEY, WILLIAM B.....New York, N. Y.
CULLEN, THOMAS S.....Baltimore, Md.
DANNA, JOSEPH A.....New Orleans, La.
DAVIS, JOHN STAIGE.....Baltimore, Md.
DEAVER, JOHN B.....Philadelphia, Pa.
DOUGHTY, W. H.....Augusta, Ga.
DOWNES, WM. A.....New York, N. Y.
ELBRECHT, O. H.....St. Louis, Mo.
FINNEY, J. M. T.....Baltimore, Md.
FRANK, LOUIS.....Louisville, Ky.
GIBBON, R. L.....Charlotte, N. C.
GOLDSMITH, W. S.....Atlanta, Ga.
GRANT, HORACE H.....Louisville, Ky.

GUERRY, LE GRAND.....Columbia, S. C.
GWATHMEY, LOMAX.....Norfolk, Va.
HAGGARD, WILLIAM DAVID....Nashville, Tenn.
HAGNER, FRANCIS R.....Washington, D. C.
HANES, GRANVILLE S.....Louisville, Ky.
HAZEN, CHARLES M.....Bon Air (Richmond), Va.
HENDON, GEORGE A.....Louisville, Ky.
HORSLEY, JOHN SHELTON.....Richmond, Va.
HUNNER, GUY LE ROY.....Baltimore, Md.
ILL, EDWARD JOSEPH.....Newark, N. J.
JACKSON, WILLIAM R.....Mobile, Ala.
JONES, EDWARD G.....Atlanta, Ga.
JUDD, EDWARD STARR.....Rochester, Minn.
KELLY, HOWARD ATWOOD.....Baltimore, Md.
LA ROQUE, G. PAUL.....Richmond, Va.
LLOYD, SAMUEL.....New York, N. Y.
LONG, JOHN W.....Greensboro, N. C.
MCGLANNAN, ALEXIUS.....Baltimore, Md.
MCGUIRE, STUART.....Richmond, Va.
MCGUIRE, W. EDWARD.....Richmond, Va.
MACLEAN, HENRY STUART....Richmond, Va.
MCMURTRY, LEWIS S.....Louisville, Ky.
MALONE, BATTLE.....Memphis, Tenn.
MARTIN, EDMUND DENEGRE...New Orleans, La.
MARTIN, FRANKLIN H.....Chicago, Ill.
MASON, J. M.....Birmingham, Ala.
MATTHEWS, WILLIAM P.....Richmond, Va.
MAYO, CHARLES H.....Rochester, Minn.
MITCHELL, JAMES F.....Washington, D. C.
MIXTER, SAMUEL JASON.....Boston, Mass.
MOORE, JOHN THOMAS.....Houston, Texas
MORRIS, LEWIS C.....Birmingham, Ala.
NICOLSON, WILLIAM PERRIN...Atlanta, Ga.
NOBLE, GEORGE H.....Atlanta, Ga.
OCHSNER, EDWARD H.....Chicago, Ill.
PAYNE, ROBERT LEE, JR.....Norfolk, Va.
PETERSON, REUBEN.....Ann Arbor, Mich.
RANSOHOFF, JOSEPH.....Cincinnati, O.
REDER, FRANCIS.....St. Louis, Mo.
RICHARDSON, EDWARD P.....Boston, Mass.
ROBERTS, WILLIAM O.....Louisville, Ky.
ROBINS, CHARLES RUSSELL....Richmond, Va.

ROGERS, CAREY P.....Jacksonville, Fla.
ROYSTER, HUBERT A.....Raleigh, N. C.
RUFFIN, KIRKLAND.....Norfolk, Va.
RUSSELL, W. WOOD.....Baltimore, Md.
SAUNDERS, BACON.....Fort Worth, Texas.
SHERRILL, J. GARLAND.....Louisville, Ky.
SMYTHE, FRANK DAVIE.....Memphis, Tenn.
STOKES, JAMES ERNEST.....Salisbury, N. C.
THOMPSON, J. E.....Galveston, Texas
TROUT, HUGH H.....Roanoke, Va.
VAUGHAN, GEORGE TULLY.....Washington, D. C.
WALKER, GEORGE.....Baltimore, Md.
WARING, T. P.....Savannah, Ga.
WATTS, STEPHEN H.....Charlottesville, Va.
WILLIS, A. M.....Richmond, Va.
WINDELL, J. T.....Louisville, Ky.
WINSLOW, RANDOLPH.....Baltimore, Md.
WYSOR, JOHN C.....Clifton Forge, Va.

Letters and messages of regret were received from the following Fellows who were unable to attend the meeting:

Dr. Charles M. Rosser, Dallas, Texas; Dr. R. S. Hill, Montgomery, Ala.; Dr. Southgate Leigh, Norfolk, Va.; Dr. Rudolph Matas, New Orleans; Dr. F. W. McRae, Atlanta, Ga.; Dr. H. Tuholske, St. Louis, Mo.; Dr. C. E. Caldwell, Cincinnati, O.; Dr. Robert T. Morris, New York; Dr. George Ben Johnston, Richmond, Va.; Dr. F. W. Parham, New Orleans; Dr. M. G. Seelig, St. Louis; Dr. J. D. S. Davis, Birmingham, Ala.; Dr. Ernst Jonas, St. Louis; Dr. R. B. Hall, Cincinnati, O.; Dr. H. T. Byford, Chicago; Dr. J. C. Bloodgood, Baltimore.

Morning Session. The Association met at the Greenbrier Hotel at 9.30 A.M., and was called to order by Secretary Haggard, who announced that through an oversight the name of Dr. Hugh H. Trout, Chairman of the Committee of Arrangements, had been left off the program.

Dr. Trout was introduced, and in speaking for the Committee of Arrangements, stated that the program spoke for itself. Every afternoon there would be a tea in the Tea Room for the ladies. The committee had carefully avoided making any set program for the ladies, as it was felt they could take care of themselves. Monday, at 6.30 P.M., there would be an association banquet in the rear of the main dining-room of the hotel,

to which the ladies are invited. After the dinner, through the courtesy of the International Film Company, films would be shown in the ballroom on preparedness, to be followed by a dance. Through the courtesy of the management of the Greenbrier Hotel and Dr. Capito, the members and guests are invited to visit and inspect the various departments of the Sanatorium and to take advantage of the swimming pool. Tuesday afternoon there would be no scientific session, but instead this afternoon would be devoted to swimming, golfing, motoring, driving, etc.

Secretary Haggard then introduced Dr. Thomas S. Cullen, Baltimore, Maryland, President of the Association, who took charge of the meeting.

President Cullen, on assuming the chair, stated that as the program was a large one there was so much to be done, he would call at once for the reading of the first paper.

1. "The Biochemistry of Topical Applications Considered from the Stand-point of Surgery," by Dr. Edward H. Ochsner, Chicago.

This paper was discussed by Drs. Nicolson, Royster, Coley, Elbrecht, Bryan, and in closing by the essayist.

On motion, which was duly seconded and carried, the following gentlemen were extended the courtesies of the floor: Dr. T. J. Watkins, Chicago; Dr. Ernest K. Cullen, Detroit; Dr. Cross, Fresno, Cal.; Dr. Gordon K. Dickinson, Jersey City; Dr. Philips and Dr. Capito, White Sulphur Springs; Dr. H. H. Sherk, Pasadena, Cal.; Dr. G. Brown Miller, Washington, D. C.; Dr. A. A. Law, Minneapolis; Dr. Barksdale, Mississippi; Dr. Charles H. Peck, New York; Dr. Emery Marvel, Atlantic City; Dr. John S. C. Woolford, Chattanooga; Dr. R. A. Bartholomew, Ann Arbor, Mich.; Dr. Nelson M. Percy, Chicago; Dr. William E. Darnall, Atlantic City; Dr. F. C. Foster, Toledo, O.; Dr. W. B. Thorning, Houston, Texas; Dr. Fennell, Rock Hill, S. C.; Dr. Miles, White Sulphur Springs; Dr. Miller, Danville, Va.

2. "Treatment of Fractures of the Femur, Especially in the Old," by Dr. George Tully Vaughan, Washington, D. C.

3. "The Open Treatment of Fractures," by Dr. H. H. Grant, Louisville, Ky.

These two papers were discussed together by Drs. Carr, Law, McGlannan, Mason, Martin, and in closing by the essayists.

4. "Arthroplasty by Means of Animal Membrane," by Dr. W. S. Baer, Baltimore, Md.

5. "Complete Bony Ankylosis of the Jaw, with Report of Three Cases by Operation," by Dr. W. P. Carr, Washington, D. C.

These two papers were discussed together by Drs. Jackson, Vaughan, Blair, and in closing by the essayists.

6. "Some Problems of Ureteral Surgery," by Dr. W. R. Jackson, Mobile, Ala.

7. "Some Problems of Ureteral Surgery," by Dr. Guy Le Roy Hunner, Baltimore, Md.

8. "Transplantation of the Ureter following Traumatism and also following Resection of the Bladder for Cancer," by Dr. E. Starr Judd, Rochester, Minn.

These three papers were discussed together by Drs. Coffey, Bovée, Payne, Kelly, Robins, Vaughan, Finney, Deaver, Long, and discussion closed by Drs. Jackson, Hunner and Judd.

On motion the Association adjourned until 2 P.M.

Afternoon Session. The Association reassembled at 2 P.M., and was called to order by the President.

9. "Postoperative Care of Prostatic Cases," by Dr. William S. Goldsmith, Atlanta, Ga.

This paper was discussed by Drs. Horsley, Hagner, Deaver, and in closing by the essayist.

10. "A Substitution of the Anal for the Vesical Sphincter in Certain Cases of Inoperable Vesicovaginal Fistula," by Dr. Reuben Peterson, Ann Arbor, Mich.

11. "A Study of the Modern Operation on Hypospadias from an Anatomical and Functional Stand-point," by Dr. James E. Thompson, Galveston, Texas.

12. "A Discussion of the Different Methods of Exclusion in the Treatment of Exstrophy of the Bladder, with Case Report," by Dr. Battle Malone, Memphis, Tenn.

These three papers were discussed together by Drs. Mayo and Robins, and discussion closed by Drs. Peterson and Malone.

13. "Giant-cell Epulis of the Upper Jaw; Report of a Case," by Dr. Francis Reder, St. Louis, Mo.

On motion the Association adjourned until 6.45 P.M.

At the Association Banquet, the President, Dr. Thomas S. Cullen, Baltimore, Md., delivered the Presidential Address, selecting for his subject, "America's Place in the Surgery of the World."

In the absence of Dr. George W. Crile, of Cleveland, Ohio, who was to have delivered a memorial address on Dr. John B. Murphy, the address was read by the Secretary, Dr. William D. Haggard.

Following the memorial address on Dr. Murphy, Senator Lane, of Oregon, was introduced and related some humorous incidents in his early experience as a practitioner of medicine and during his later career in politics.

Adjourned.

SECOND DAY.—*Tuesday, December* 12, 1916.

Morning Session. The Association met at 9.15 A.M., and was called to order by the President.

14. "Cure of a Double Aneurysm in Proximal Occlusion with the Autoplastic Fascial Flap," by Dr. E. G. Jones, Atlanta, Ga.

15. "Some Points in Reference to Surgery of the External Carotid Artery," by Dr. William Perrin Nicolson, Atlanta, Ga.

16. "(*a*) Traumatic Aneurysm of the Superficial Temporal Artery; (*b*) Carcinoma of Mammary Tissue Misplaced in the Axilla," by Dr. J. Shelton Horsley, Richmond, Va.

These three papers were discussed together by Drs. Mason, Thompson, Sherrill, Blair, Richardson, and discussion closed by Dr. Jones, Nicolson and Horsley.

17. "Cholecystitis with and without Gall-stones, with Classification of Symptoms," by Dr. George A. Hendon, Louisville, Ky.

18. "Recurrence of Gall-stones," by Dr. John B. Deaver, Philadelphia, Pa.

These two papers were discussed together by Drs. Finney, Mixter, Mayo, Guerry, Carr, Elbrecht, McGlannan, and discussion closed by the essayists.

The President appointed as an Auditing Committee Drs. Stokes, Sherrill and Malone.

19. "A Consideration of the Amount of Thyroid Tissue Which Should be Removed," by Dr. Willard Bartlett, St. Louis, Mo.

Discussed by Drs. Finney, Horsley, Martin, Blair, Guerry, and discussion closed by the essayist.

On motion the Association adjourned until 8 P.M.

NOTE. There was no afternoon session held. The afternoon was devoted to golfing, motoring, swimming, driving, etc.

Evening Session. The Association reassembled at 8 P.M., and was called to order by the Vice-President, Dr. Willard Bartlett.

20. "The Results of Perforated Gastric and Duodenal Ulcers at the Massachusetts General Hospital," by Dr. E. P. Richardson, Boston, Mass.

21. "A Further Report of Eight Cases of Syphilis of the Stomach, with Lantern Slides," by Dr. William A. Downes, New York City.

22. "Discussion of the Present Status of Surgical Treatment of Gastric and Duodenal Ulcers," by Dr. R. C. Coffey, Portland, Oregon.

These three papers were discussed together by Dr. Finney, and discussion closed by Drs. Downes and Coffey.

23. "Choice of Operative Procedure in Cancer of the Rectum and Pelvic Colon," by Dr. Charles H. Mayo, Rochester, Minn.

24. "Enterostomy; a Perfected Technic," illustrated with lantern slides, by Dr. John W. Long, Greenboro, N. C.

Discussed by Dr. E. D. Martin, New Orleans.

Dr. Franklin H. Martin, Chicago, Ill., gave a talk on "Medical Preparedness." He said:

The administration of the United States Government is anxious to put into the field or into training just as many men as it is possible in the shortest time that it can be accomplished. Last week the first meeting of the Council on Defense was held in Washington. Certain members of the Council met with the members of the Cabinet. Before meeting the members of the Cabinet each member of the Council on Defense was asked his opinion in regard to universal training. We found that every member, the seven members appointed by the President, was absolutely in favor of universal service or universal training. On going to the meeting with the six members of the Cabinet, representing the balance of the Council, we soon found that they had in mind practically the same idea that we had, but someone suggested, "Do you know what universal service means?" Do you know that it means putting into training immediately, or as soon as it can be accomplished, if it is on the basis of the Swiss plan, from 12,500,000 men to 15,000,000 men in this country? If you realize that, and you further realize that you have the responsibility of doing it, you will hesitate just a minute before you announce to the public of the United States what is going to come. Therefore, we

have thought it well to begin immediately, while the campaign of education is still going on, to put just as many men as possible to do it, and await the legislation that is absolutely necessary to have universal service, urging that at the same time. With that idea in view I came here this evening.

Dr. Simpson, who is secretary of the Committee on Medical Preparedness, and myself, decided the one thing we could do immedately by June 1 was to put in training, ready for service, 3500 medical men if we have the same number of graduates from medical colleges this year we had last year. With that idea in view, at 9 o'clock Friday morning we went to the office of the Secretary of War and asked that the Cabinet and the President and the Administration sanction putting the medical schools under military training immediately. We told them that our plan was this: In each school consent was to be gained immediately, and a curriculum was prepared to begin on February 1, to be carried out by June 1, that would militarize every medical man who graduated at that time to the extent that he would be an efficient medical officer if called to service. Secretary Baker, without one moment's hesitation, took us to the next room and introduced us to the old veteran General Scott. We told him the story. With a twinkle in his eye he said, "Send for Major So-and-So, of the Department of the Surgeon-General's Office, with instructions for them to coöperate with this plan." We knew the Surgeon-General's Office in advance would favor it. Within an hour we were at the War Office, consulting with Colonel Arthur, who is authorized to make the curriculum for us, one for a four months' training of the medical students of the United States who will graduate in June, which would offer them full immediate service in the Reserve Officers' Corps of the United States Army; the second curriculum to apply to Junior and Senior classes of this year and next year that would give them a more complete medical training that would extend over the whole year. We want this intensive four months' training that will enable us to get these men into the field if necessary.

Now, on Friday, when we return to Washington, we will have first a list of the United States medical officers who are to be assigned to the ninety-five medical schools in the United States to begin the work on February 1. These men are being selected at the office of the Surgeon-General. We will have a curriculum for these men to carry out in each medical school

that will be completed June 1, and the second curriculum that will be applicable to the two years.

Now, this is what you can do. You got us into this job and you must help us to carry out the plan. I want to assure you that it is some job, and you will have to help with a great many plans before we get through the next two years. This is the first one: Every man here, I take it, is a teacher in a medical school, and within the next two weeks he will have to vote on this plan, "Shall our school be militarized?" You will vote yes. We will send to the dean of the medical school and to some other men of prominence in the medical school a notice to the effect that they may be summoned to Washington by Secretary Baker and the President and the plan put up to them to represent the school and be asked to coöperate. Some of you will be asked to go to Washington and help with this plan.

There is a feeling in Washington that we cannot go to war without feeling that we are going to need money, and the fact that the Emperor of Germany has made some intimation that he is ready for peace, a proposition that is going to be refused is going to make this war more desperate than ever. When it becomes more desperate than ever—and we have had difficulty in keeping out of it as it is—when it becomes more barbaric than ever we are going to need men, and that is my message. I want every one of you to help put over this part of the program, which is very small compared with all the rest.

25. "Further Observations in the Diagnosis and Treatment of Sarcoma of Long Bones," by Dr. William B. Coley, New York City.

On motion the Association adjourned until 9 A.M. Wednesday.

THIRD DAY.—*Wednesday, December* 13, 1916.

Morning Session. The Association met at 9 A.M., and was called to order by the President.

26. "Ultimate Results following Nephrorrhaphy in Cases of Pathological Nephroptosis," by Dr. John G. Clark, Philadelphia.

27. "Renal Ptosis: its Relation to Orthostatic Albuminuria, with Report of a Case," by Dr. J. M. Mason and Dr. I. M. Mason, Birmingham, Alabama.

These two papers were discussed jointly by Drs. Boldt, Kelly, Hunner, Marvel, and in closing by Dr. Clark.

28. "Congenital Lipoma of the Cheek," by Dr. Joseph Ransohoff, Cincinnati, Ohio.

29. "Repair of Cleft Palate in the Infant," illustrated with lantern slides, by Dr. V. P. Blair, St. Louis, Mo.

These papers were discussed together by Drs. Davis, Thompson, Ochsner, Horsley, Martin, Ransohoff, Jackson, Downes, and discussion closed by Dr. Blair.

30. "Some Cases of Cystic Hygroma; Some Affections of the Submaxillary Salivary Glands," by Dr. R. Winslow, Baltimore, Md.

Discussed by Drs. Blair, Thompson, Downes, and discussion closed by the essayist.

31. "Traumatic Asphyxia," by Dr. J. Garland Sherrill, Louisville, Ky.

Discussed by Drs. Winslow, Reder, and in closing by the essayist.

The President: We will take up the Executive Session now, and I will ask Dr. Sherrill to read the report of the Auditing Committee.

Dr. Sherrill: The books of the Secretary and Treasurer have been carefully examined and found correct.

JAMES E. STOKES,
J. GARLAND SHERRILL,
BATTLE MALONE,
Committee.

The President: What disposition will you make of this report?

Dr. Boldt: I move that it be accepted.

Seconded and carried.

Dr. J. M. T. Finney, Chairman of the Council, presented the following report:

WHITE SULPHUR SPRINGS, W. VA.,
December 13, 1916.

REPORT OF THE COUNCIL

The Council endorses and recommends the following changes in the Constitution and By-laws of the Southern Surgical and Gynecological Association, this being the report of the Special

Committee composed of Dr. Stuart McGuire, chairman; Dr. John W. Long, and Dr. J. M. T. Finney, appointed at the last meeting.

1. Change the title from the Southern Surgical and Gynecological Association to the Southern Surgical Association and change word Member to Fellow and Membership to Fellowship wherever they occur in the Constitution or By-laws.

2. Substitute the following for Article II of the present Constitution: The object of this Association shall be to further the study and practice of surgery in its various departments, especially among the profession of the Southern States.

Substitute the following for Article III and Article IV of the present Constitution:

3. Article III, Section 1. The qualifications which must be possessed by applicants for Fellowship in the Association shall be:

1. Good standing in his State Association.

2. Experience covering not less than ten years of professional work.

3. Practice limited essentially to surgery or one of its specialties.

4. Recommendation by three Fellows, two preferably from his own State.

Section 2. Application for Fellowship shall be filed with the Secretary on the blank form provided for that purpose. The Council at each annual session shall carefully consider all candidates and may nominate one for each vacancy that exists on the roll for election or rejection by the Association.

Article IV. The Honorary Fellows of the Association shall not exceed twenty-five in number. They shall be nominated by the Council and elected by the Association. They will not be required to pay any dues and shall enjoy all the privileges of other Fellows, except that of voting or holding office; this exception does not apply to Founders.

In Article II of the By-laws relating to dues the word $15 shall be substituted for $10.

Substitute in Article VII of the By-laws, in place of the words, "For the sum of five hundred dollars ($500)," the following: "For such sum as may be voted him by the Council."

Substitute the following for Article XIII of the By-laws: "The Council shall have power to drop from the roll of Fellows any Fellow who fails to pay his dues for more than one year

or misses three consecutive Sessions of the Association, or who for any reason fails to retain his good standing in his State Association."

5. The Council recommends the adoption of the following resolution:

WHEREAS, Many of the Fellows have failed to attend any of the meetings of the Association for from five to fifteen years; and

WHEREAS, There is a very large waiting list of desirable men.

Resolved, The Association hereby declares that the Fellowship of all members who have not attended the meetings of the Association in eight consecutive years is hereby forfeited.

The above list includes six Fellows.

6. The Council further recommends that the vacancies in the roster be filled by the following applicants:

Dr. Fred T. Murphy, St. Louis, Mo.
Dr. W. Burton Thorning, Houston, Texas.
Dr. Arthur A. Law, Minneapolis, Minn.
Dr. Marion Souchon, New Orleans, La.
Dr. M. H. Biggs, Rutherfordton, N. C.
Dr. E. H. Miller, Jr., Danville, Va.
Dr. John W. Barksdale, Winona, Miss.
Dr. Charles H. Frazier, Philadelphia, Pa.
Dr. F. G. Du Bose, Selma, Ala.
Dr. Charles H. Peck, New York, N. Y.
Dr. W. T. Black, Memphis, Tenn.
Dr. Donald C. Balfour, Rochester, Minn.
Dr. Claude C. Coleman, Richmond, Va.
Dr. C. N. Cowden, Nashville, Tenn.
Dr. S. W. Pryor, Chester, S. C.
Dr. E. Dunbar Newell, Chattanooga, Tenn.

7. The Council further recommends that the seven surviving Founders of the Association be transferred to the list of Honorary Fellows. They are:

Dr. R. M. Cunningham, Birmingham, Ala.
Dr. J. D. S. Davis, Birmingham, Ala.
Dr. J. A. Coggans, Alexander City, Ala.
Dr. Geo. Ben Johnston, Richmond, Va.
Dr. John W. Long, Greensboro, N. C.
Dr. I. S. Stone, Washington, D. C.
Dr. Hugh M. Taylor, Richmond, Va.

8. That the resignations of Drs. J. D. Bloom, B. C. Hirst, and H. D. Fry be accepted.

9. That the deaths of our Fellows, Dr. John B. Murphy and Dr. Joseph A. Gale be appropriately recorded.

10. It is recommended that the next meeting be held at St. Augustine, Fla., at the Hotel Alcazar, Tuesday, Wednesday, and Thursday, December 11, 12, and 13, 1917, and that Dr. Carey P. Rogers, of Jacksonville, be requested to act as Chairman of the Committee of Arrangements.

The resignation of the Secretary was received. After fourteen years of exceptionally satisfactory service the Council recommended it be accepted, with the sincere regret and grateful thanks of the Association.

11. The following officers are nominated for the ensuing year:

For President, Dr. William D. Haggard, of Nashville, Tenn.

Vice-Presidents, Dr. J. Ernest Stokes, of Salisbury, N. C., and Dr. Francis R. Hagner, of Washington, D. C.

Secretary (to fill out the unexpired term of one year of the former secretary), Dr. Hubert A. Royster, of Raleigh, N. C.

The Treasurer holds over another year.

12. That the vacancy on the Council occasioned by the expiration of service of Dr. Rudolph Matas be filled by the retiring President, Dr. Thomas S. Cullen.

All of which is respectfully submitted by

DR. BACON SAUNDERS,
DR. GEORGE H. NOBLE,
DR. JOHN W. LONG,
DR. L. S. MCMURTRY,
DR. J. M. T. FINNEY,
Chairman of the Council,
DR. THOMAS S. CULLEN,
Ex-officio.

The report of the Council was considered, section by section, as read, and on several motions, duly seconded and carried, was adopted.

Dr. Cullen: It is needless for me to say how we all feel in regard to Dr. Haggard. In looking over the list of Secretaries since the organization of the Association in 1888, I find that we have only had two secretaries, Dr. W. E. B. Davis and Dr. Haggard. In looking over the list of presidents of the Association we find that the first one was W. D. Haggard, and it is

eminently fitting that Dr. Haggard should head the list now as President, to be added to the list of Presidents we have already had, and it gives me the greatest pleasure to transfer to you, Dr. Haggard, this gavel.

Dr. Haggard, in accepting the Presidency, said: It is scarcely necessary for me to tell you how very deeply I appreciate your generosity to me. It can be nothing more than generosity, because nobody realizes the inefficacy of my feeble work more than myself, and particularly in being chosen for this exalted position. Next to my own daily work and my own family I do feel that I have given this Association my best efforts, and I only feel that perhaps you have made a mistake in spoiling a very enthusiastic secretary and putting him in a place that he may not fill very efficiently. I am afraid you have this morning destroyed in a way the usefulness of at least an enthusiastic and interested worker.

I cannot begin to tell you how loath I was to give up the Secretaryship of this Association, because, as I have said before, we have all grown up together, and this Association, aside from being a great scientific association, has come to be a very delightful social one, and everybody I think looks forward to the meetings with the greatest anticipation.

This meeting has been one of the most delightful, if not one of the most successful, meetings we have ever had. Of course, we say that every time, like the mother about the newborn; but in all sincerity I do believe we have had a most magnificent meeting. Ninety members have been present; thirty-eight papers will have been read, so that we must realize what a feeling of gratification we must have under these exceptional circumstances. I can only say that if, in a small way, I can follow in the footsteps of my distinguished predecessors it will be an additional pleasure and delight to me. I thank you from the bottom of my heart for the very great courtesy you have shown to me.

There were cries of Speech! Speech! Speech! from the newly elected Secretary, Dr. Royster.

Dr. Royster said: The cat may look upon the king; and what a fearful task the cat has set before him to follow such a king! This is a responsibility as well as an honor. I do not know what I can say. I am supposed forever hereafter to hold my peace and to use my pen. I am here for work and not for talk. If I can do both as well as Dr. Haggard, I shall have no

fear of the reputation which I shall leave behind me. I shall strive to follow the king, and I promise you that it will be indeed a following. A certain distinguished statesman said that he would follow certain policies. My only policy will be to follow the policies of Haggard, because he has left to us not only an influence for excellent work, but what counts for more in this organization, an influence for holding intact the principles and the spirit which are the very heart of this Association—conservative, if you please, but always straight, always sure, and always standing for the truth.

I have nothing new to advance, and I shall henceforth have nothing new to advance except as conditions and times may change. I shall content myself with following the policy which has been so successful in the past. The unwritten rules of this organization are more important in many ways than those contained in its Constitution and By-laws. These, with the help of the President for the next year and of those through all other years, I shall endeavor to sustain.

32. "Use of Free Grafts of Whole Thickness of Skin for the Relief of Contractures," by Dr. John Staige Davis, Baltimore, Md.

This paper was discussed by Drs. McGlannan, Jackson, Hendon, Gwathmey, Law, Finney, and in closing by the essayist.

On motion the Association adjourned until 2.30 P.M.

Afternoon Session. The Association reassembled at 2.30 P.M., and was called to order by the President.

33. "Chloride of Zinc in Uterine Hemorrhage Caused by Uterine Myomata and Metro-endometritis or Fibrosis Uteri," by Dr. Herman J. Boldt, New York City.

Discussed by Drs. Bonifield, Clark, Watkins, Ransohoff, and in closing by the essayist.

34. "The Pathological Uterus at the Menopause," by Dr. Charles R. Robins, Richmond, Va.

Discussed by Drs. Blair, Peterson, Boldt, Bonifield, Elbrecht, and in closing by the essayist.

35. "Gastric Cancer," by Dr. Frank D. Smythe, Memphis, Tenn.

Discussed by Drs. Sherrill, Carr, and in closing by the essayist.

36. "A Proposed Operation for Prolapse and Retroversion of the Uterus, with Fascial Support," by Dr. John T. Moore, Houston, Texas.

Discussed by Drs. Peterson, Watkins, Jackson, Blair, Bonifield, Ill, and discussion closed by the essayist.

Dr. Joseph Ransohoff: Speaking of the entertainment features in connection with our meeting, the Committee of Arrangements, through the untiring efforts and energy of Dr. Hugh H. Trout, has been responsible for the delightful times we have had, and it is only proper that as an association we should extend a vote of thanks to this committee and to the hotel management for their splendid accommodations; also to Senator Lane, of Oregon, for the felicitous and interesting talk he gave us at the banquet. I move the adoption of these resolutions. Seconded and unanimously carried.

As there was no further business to come before the meeting, on motion of Dr. Bonifield the Association adjourned to meet at St. Augustine, Florida, Tuesday, Wednesday and Thursday, December 11, 12 and 13, 1917.

WILLIAM D. HAGGARD, M.D.,
Secretary.

ADDRESS OF THE PRESIDENT

AMERICA'S PLACE IN THE SURGERY OF THE WORLD

By Thomas S. Cullen, M.B., F.A.C.S.
Baltimore, Maryland

When searching for a subject for this meeting many themes presented themselves to me; but one important topic has stood out conspicuously—the relation of American surgery to that of other nations. Consequently I shall take as my topic "America's Place in the Surgery of the World."

That we may appreciate adequately the advances in surgery it is necessary for us to look back at the conditions that existed as recently as only fifty years ago. At that time, although many operations were performed in hospitals, the well-to-do shuddered at the thought of being taken to an institution and were cared for at home. The poor went to the hospital, but mostly against their will.

When a patient entered the hospital he was looked after in some institutions by male attendants, in others by women, who, although they did their best, were little more than helpers. In no hospitals were there any trained nurses to be found.

The hospital internes were too few in number adequately to look after the patients coming under their care. When the patient was ready for operation he was usually

carried to a large amphitheater where the operation was undertaken. Some operators would appear in full-dress suits or in long black coats. The sleeves of these coats had been ingeniously slit up at the sides so that the surgeon could readily fold them back until his arms were freed to the elbows. The assistants, who were frequently medical students, at the beginning of the school year, knew little about the individual instruments or their uses, but to them was entrusted the selection of the necessary implements and the arrangement of them for the operation. Even with these primitive surroundings the patient was infinitely better off than his fellow of fifty years before, because in the meantime anesthetics had been discovered. He was put to sleep, and the operator, who had usually in the meantime washed his hands, commenced the operation. The giving of the anesthetic was generally entrusted to some one who had had very little experience in its administration; consequently, untoward symptoms frequently interrupted the progress of the operation. Some surgeons would think nothing of putting their hands into the wound, and then, after handling the sheets or blankets around the patient, of placidly continuing the operation. What need of worry? They were totally ignorant of the possibility of contamination. Even since my graduation I have heard a surgeon specifically warn his students against the dangers of contaminating the clean wound. He would then wash up carefully and, while admonishing his students, would walk around the amphitheater with his hands in his pockets. The next minute these hands went directly from his pockets into the wound. Needless to say this surgeon, although he had a partial theoretical knowledge of bacteriology, had absolutely no conception of its practical application. I have seen another surgeon of excellent repute place the handle of his knife in his mouth for safe-keeping while he was busy tying ligatures.

The operations in those days were limited in large measure to lesions on the surface of the body and to pathological conditions of the extremities requiring surgical interference. The opening of the abdomen or of the chest cavity was a rare occurrence. The after-treatment of the surgical cases fell mainly upon the surgeon or the interne, because the female attendant in many instances did not have the necessary knowledge.

Most of the private patients were operated upon in their own homes. Just imagine a member of this Association as a routine procedure getting up early in the morning to gather his instruments together, communicating with two or three of his medical friends (not by telephone), and then repairing to the patient's home to arrange for the operation. The surgeon, of course, looks after all the details, minor as well as major, himself. He is thoroughly tired out before he commences the operation. The operation itself is rendered long and tedious by the poor anesthesia, and possibly because the surgeon has inadvertently left at home some instrument very necessary to the successful handling of the case. The operation over, he or one of his assistants has to remain with the patient all night.

You and I often think that we are hard pressed, but the average surgeon of fifty years ago would have felt that he was literally in clover if he had been surrounded by the safeguards and assistance that we take as a matter of course at the present day.

The Surgery of Today. Today the telephone rings, the family physician, a most competent man, tells you that Mr. —— has a clear-cut case of appendicitis. The patient at once voluntarily suggests that he be taken to the hospital. You ring up the hospital and arrange for the time of operation. When you get there the patient's history has already been carefully taken, the urine examined,

and a blood-count made. You examine the patient, confirm the diagnosis, change your clothes, wash up and proceed to the operating-table. The patient in the meantime has been carefully cleaned up, has been anesthetized by an expert, and you at once begin the operation. Every instrument that may make your work easy is at hand, and you have an ample corps of competent assistants and nurses. The operation over, the patient is under the constant supervision of a nurse and is visited frequently by the house man. If the convalescence is normal, you probably see him once a day or every other day. We talk about the improvements in rapid transit, in electricity, and in business methods, but none of these can compare with the great strides made in the handling of surgical patients.

Many factors have been contributory to this wonderful advance in surgery, notably the development of asepsis due to the fundamental labors of Pasteur and of Lister, and to the knowledge obtained as a result of years of experience. I shall not give a detailed description of the many improvements in the methods of operating or enumerate the many diseases that have year by year been transferred from medicine to surgery; nor shall I indicate to you the steady advance made where in the past nothing was thought possible. Read "The History and Development of Surgery During the Past Century," a charming address delivered by Dr. Frederic S. Dennis, of New York, before the International Congress of Arts and Sciences at St. Louis in September, 1904.* It is brimful of information, and after reading it one has a feeling of pride in realizing that America has played such a prominent rôle in the phenomenal advance of the surgery of the world during the last fifty years. With the surgical achievements since 1904 you are all thoroughly familiar. I wish here to refer

*Am. Med., 1905, ix.

chiefly to the large debt we owe to hospital authorities and to the trained nurse.

The Hospital. Do we realize the stupendous sum invested in hospitals in the United States? Recently, I asked one of the foremost hospital experts in the country to tell me approximately how much money was invested in hospitals, sanitaria, and institutions for the care of the insane. He said that the sum was enormous and probably amounted to $3,000,000,000. Be this as it may, most of us have gone along complacently, completely engrossed in the small institutions with which we are connected, little realizing that thousands of others have been doing just as much for the improvement of the care of the sick.

Most institutions have had small beginnings. With their gradual development and increased responsibilities it was realized by the larger institutions that they needed men of affairs, men with a broad vision on their boards of trustees. Thus at the present time the leading hospitals of the country number among their trustees some of the best-known and most far-seeing men.

Inseparably linked with the molding and the development of the hospitals of the United States is the name of that dean of American hospital superintendents, Dr. Henry M. Hurd, for a quarter of a century superintendent of the Johns Hopkins Hospital, a man of rare judgment and tact, a man who for years has done yeoman service in promoting the betterment of hospitals.

The superintendent of the small hospital of today is usually a trained nurse, who not only guides the nurses' training-school, but also takes care of the executive duties of the hospital. The larger institutions, as you all know, usually have a medical man as the superintendent. The larger the hospital becomes and the more manifold its activities the more necessary is it to have an executive who, in addition to his innate tact, level headedness, and

medical knowledge, must be a thorough master of detail and an able organizer; just such a man as could equally well handle a large business establishment or a railroad. A medical man so equipped is difficult to find. Fortunately, this paucity of ideal hospital superintendents will not always exist. The need has been fully realized. In the hospital with which I am connected there are three assistant superintendents. These men are not only of great assistance to the superintendent and to the hospital, but are themselves developing into first-class executives, and after a few years will undoubtedly have charge of other hospitals. This method of training hospital executives is growing in vogue, and if all the leading hospitals pursued this same method the supply of competent hospital executives would keep up with the demand.

You and I profit greatly by meeting with one another and exchanging ideas, just as we are doing at this annual meeting. Hospital superintendents, assistant superintendents, and superintendents of nurses, have likewise realized the value of such meetings, and some years ago formed the American Hospital Association. They very wisely also included in their membership hospital trustees and physicians and surgeons particularly interested in hospital management. I would strongly urge each and all of you as soon as you reach home to find out if the superintendent and the superintendent of nurses in the hospital or hospitals with which you are connected are members of the American Hospital Association. If not, communicate with your hospital trustees, impress upon them the loss that your hospital is sustaining through their lack of membership, and tell them that it is the duty of the hospital not only to see that their executive officers become members, but that they go as the official representative of the hospital, all expenses being defrayed by the hospital board.

We can profitably spend a moment in considering the

program of the eighteenth annual conference of the American Hospital Association, which was presided over by Dr. Winford H. Smith, and which was held in Philadelphia two months ago. Among the many interesting subjects discussed were: What dispensary work should stand for. Clinics for venereal disease: why we need them; how to develop them. Industrial accident cases in dispensaries: should they be accepted? How shall the finances be managed? New features in dispensary work. Report of the committee on hospital construction. The hospital dietary. The so-called diphtheria epidemics in general hospitals: preventive measures. Autopsies: methods of obtaining them and measures for protecting the hospital.

Many other interesting and important topics were considered, and then there were round-table sessions for the large hospitals and also for the smaller hospitals. At these sessions hospital superintendents compared notes, told of their difficulties, and asked how these could be best overcome. These sessions are invaluable. The best brains of the large and small hospitals are gathered together, and problems that have worried a member of the association can often be quickly and easily solved by another member who has in the past successfully dealt with a similar condition.

At these round-table sessions San Francisco and New York, Texas and Canada, New Orleans and Minnesota, in fact all parts of North America are gathered together and compare notes, each imparting to the other something that is new and valuable.

Every hospital that is trying to do first-class work should send at least one or two representatives to the American Hospital Association. Those of you who are living in the smaller localities know how difficult it is to get satisfactory plans for new hospitals, and even when the buildings are completed you are often chagrined to find that many essentials have been overlooked. The American Hospital Asso-

ciation has for several years had under contemplation the establishment of a central bureau where the duplicate plans of all existing and contemplated hospitals, both large and small, could be kept. The value of this is at once evident. When a board of trustees decide to build a new hospital they will immediately consult this collection of plans. Knowing the cost of each they will pick out the five or six that appeal to them most and can then visit these half-dozen institutions instead of being compelled to go throughout the country before discovering the exact type of institution needed. This plan of the association will undoubtedly be so broadened that it will also include the latest in hospital furnishing, the best methods of executive management of hospitals, and also the operating tables, instruments and complete equipment for the operating room.

When this hope of the association is realized one will not only be able to get with the minimal amount of labor the best hospital plans but will also be guided in the purchase of the entire hospital equipment. This will bring about an enormous saving not only in the initial hospital expense but in the subsequent purchase of supplies.

The hospital superintendents of the United States are in thorough sympathy with the great advances in medicine and surgery and are a most important factor in the development of both. It is the coöperation on the part of the superintendent, the superintendent of nurses, the operating-room nurses, the ward nurses, and the assistants that enable the surgeon to do the maximal amount of good.

The Trained Nurse. If the Crimean War had done nothing more than develop a Florence Nightingale it would have been well worth the sacrifice of so many brave men on both sides in that bloody war.

We in surgery rely largely on asepsis for our success. Asepsis for dressings, instruments and for everything coming in contact with the patient depends upon the operating-

room nurse. Has it ever occurred to you how seldom this trust is misplaced? Is there one of us who, if put to the test, would show such an unfailing response to our duty? Surgeons make mistakes, assistants are not infallible, but in a first-class operating-room a failure on the part of the nurse is almost unknown, although her duties are as important as, if not more important than, those of the surgeon and his assistants.

The after-care of the patients is entrusted almost entirely to the ward nurse. Here also we find a fidelity that cannot be excelled in any other walk of life. Were it not for her constant vigil many of our successes would be written as failures. In the summing up of the brilliant advances in surgery the achievements of the trained nurse stand side by side with those of the surgeon. In no other country is the standard of nursing as high as it is in America. The splendid work done by the American nurse is in part due to her excellent preliminary education, in part to careful and extended training, in large measure to the fact that she knows her labors are thoroughly appreciated, and lastly to the fact that after graduation she is an independent member of society and of a recognized profession. Do you realize that the American Nurses' Association has an army of 30,000 members and that 7000 of these are enrolled in the American Red Cross?

The Assimilation of Surgical Knowledge. Many medical societies have good working libraries, and I am glad to see that these are increasing in number. Connected with the medical schools one also finds aggregations of splendid books. Among the larger libraries are those of the College of Physicians of Philadelphia, the Boston Medical Library, and the John Crerar Library of Chicago. The greatest medical library in the world, however, is the Surgeon-General's Library in Washington. In it are to be found every medical journal published, complete sets of

the old journals of nearly every country, all the newer medical books and most of the older ones—it is a storehouse of old and priceless volumes. A library to be of value must have a good index. The index catalogue, the real monument of that far-seeing genius, the late John S. Billings, contains the titles of nearly all that has been published in medicine. Let us go to the library for a few moments. We want to look up a certain subject. A glance through the catalogue will give us the literature on the subject up to a certain date. The *Index Medicus* is then examined and the references up to the last few months are found there. The index cards are then furnished and in the short space of half an hour we have references to all that has been written on the subject up to the previous month. This list is given to the librarian, and behold, the originals of practically all of these are around you on the table in twenty minutes. I say practically all, because in nearly every instance not a single book is missing. Such a feat can rarely be duplicated in any other library. One is frequently able to accomplish more in this library in a day than would be possible in another library in two or three days.

Personally, I am under lasting obligation to the library authorities for the unfailing courtesy and continual help they have given me during the last twenty years. This library is the gem of American medicine. Some of you may be unaware of the fact that books from the library may be sent to you direct or be gotten through your own medical library.

The Dissemination of Surgical Knowledge. Naturally from time to time surgeons wish to enlighten their confrères concerning some rare case that has come under their care or to publish an analysis of their findings in a certain group of cases. We have in this country ample means of disseminating this knowledge. Nowhere in the world is there another medical journal that has such a

large circulation as the *Journal of the American Medical Association.* The success of this journal has in large measure been due to the able editor, Dr. George H. Simmons. Any article published in the official organ of the American Medical Association is soon known the world over. I have watched with the greatest pleasure the steady rise in the number of subscribers of the *Journal* from about 9000 in 1899, when Dr. Simmons became editor, to 68,000 at the present time.

Two surgical journals stand out prominently: The *Annals of Surgery,* under the editorship of Dr. Lewis S. Pilcher, has stood the test for years and has been the means of adding greatly to the prestige of American surgery. *Surgery, Gynecology and Obstetrics,* founded and edited by Dr. Franklin H. Martin, is a proof of what can be accomplished. The splendid reproductions of its illustrations and the abstracts of the newer and more important surgical articles from all countries enable the busy surgeon to keep well abreast of the times.

These three journals, with several others that I might mention, give the American surgeon splendid avenues for putting before the medical world anything that he has accomplished.

Wherein We May Improve Our Surgery. It has often been said that our profession contains many half-baked surgeons; and the charge is perfectly true. One might excuse an inexperienced mechanic for attempting to repair the mechanism of an expensive limousine. If he perchance does much damage, this can be remedied by a good mechanic, or at worst the injured parts can be duplicated. The novice is given an old or practically worthless machine to experiment with. When it comes to surgery the well-to-do patient usually employs the most expert surgeon he can find. The majority of the poor and incapacitated also come under the care of the experienced surgeon,

but some fall into the hands of men who are by no means capable of dealing with intricate surgical cases. These physical wrecks are just as dear to their families as are those who live in affluence, often more so, and it is our duty to see that the maximal number of them are saved. Machines can be duplicated, human lives never!

How can we eliminate the evil? In the first place by putting a premium on careful, conscientious work, and in the second place by adequately training the coming generation. Most of these unbaked surgeons are essentially good men; they mean no wrong, and their only fault is a lack of the requisite training. A few, I am sorry to say, are essentially commercial and seem to have little appreciation of the value of human life. They see a surgeon remove an appendix with the utmost ease and think that they can do it just as well, little realizing that it is the long years of training of the operator coupled with the excellent operating facilities that enable the expert to perform the operation so satisfactorily. The inefficient operator also fails to realize that a complicated appendix operation may be one of the most difficult in surgery.

Many of us have realized that this state of affairs should not exist, but have not had the courage to act, or did not realize how the condition could be remedied. It was Dr. Franklin H. Martin, of Chicago, who not only suggested a remedy but took action. The College of Surgeons was the result. Some surgeons looked on with skepticism, but I think all will now agree that the college will be the most effectual means of controlling the unwarranted operating by inexperienced men. In such a vast undertaking some mistakes are bound to occur. Some thoroughly capable men have doubtless been kept out and a few black sheep admitted, but the sum total has been a tremendous advance in the right direction. A premium on good work has been established, and those men who have not measured up to

the requirements will bestir themselves to get the necessary training which will enable them to gain membership in the college, for sooner or later no man who is unable to gain admission to the American College of Surgeons will be considered eligible for the surgical staff of any self-respecting American hospital. Too much credit cannot be accorded Dr. Martin, in whose mind this plan originated, and to Dr. John M. T. Finney, the first president of the college; Dr. Albert J. Ochsner, and others for the great amount of time and labor they have devoted to this remarkable advance in American surgery.

There are a few matters in connection with our own work that I may now mention.

Promptness in the operating-room is a very important factor. Of course I realize that where the surgeon operates in several hospitals his operations in the first hospital may be more complicated than he had any idea of, and may consume far more time than had been anticipated, thus rendering him late at his second hospital. But there is nothing that so demoralizes an operating-room staff as the continual lateness of the operator, and there is usually little excuse for his being late for the first operation of the day. This may seem to be a very trivial point; nevertheless it has a very important influence on the day's work. Another matter that some of us pass over lightly is keeping the family physician posted as to the condition of his patient. He has frequently watched the case carefully for weeks, and after due time has prevailed upon the patient to come under our care for operation. It is really incumbent on us not only to inform him fully as to just what was done at the operation but also to report the patient's progress. Looking at it from an entirely selfish standpoint this is a wise procedure, because in subsequent months or years we may want to find out from him just how the patient is at the present time.

If you or I go to the head of a prominent business house or to a railroad president and ask for any important information concerning the business or the railroad we can usually obtain the desired information at once. Our work also should be thoroughly systematized. Careful histories, operation notes, and laboratory findings are, of course, recorded in all good modern hospitals. These cases should be carefully analyzed at frequent intervals to find out what have been the immediate results. Furthermore, we should have a definite follow-up system to see what benefit the patient has derived from the operation. Probably the most indefatigable follower-up of old patients is my friend Joseph C. Bloodgood. His studies on the after-results in the hernia cases and in cancer of the breast are well known to all of you. More recently this tracing of old patients has been carried out most systematically by the Mayo Clinic, Dr. E. A. Codman, of Boston; Dr. George Brewer, of New York, and others. I feel confident that ere long all hospitals will have a department devoted to the tracing of former patients. It is a task that can be admirably handled by the record department. This is a branch of hospital work that is as yet in its infancy, but one that will soon be of tremendous value not only to the hospital but also to the patients.

You and I scan the recent literature for methods that will enable us to do better work. Are we doing our share to enlighten the other fellow? We should publish our rare cases at once, otherwise they are soon forgotten amid the multiplicity of other duties. The digest of groups of cases requires sometimes months or years before they can be analyzed so that the results may be of real value to the public. Not only should we do our share in publishing but our house staff should be stimulated to write short surgical articles. It is necessary for them to form the habit of putting down in print what they see, for this habit

will prompt them to read up thoroughly on the given subject. The older men thus learn from the younger men and the younger men profit by the mature judgment of their elders.

Illustrations. The attractiveness of any publication is greatly enhanced by good illustrations; in fact, a good picture is often worth more than ten pages of text. Have you noticed the wonderful improvement in the medical illustrations in the United States during the last twenty years—especially since the appearance of Dr. Kelly's work on *Operative Gynecology* in 1898? Max Broedel, Hermann Becker, and August Horn were in large measure responsible for the inauguration of this improvement, which since then has been supplemented by other artists.

During the summer of 1909, while at my camp, the thought came to me that it would be a splendid thing for American medicine if we had a department of art in medicine, where artists who wanted to make medical art their life-work could get a training of two or three years. I felt that if this could be accomplished, in ten years all the leading medical centers could have good medical artists and that in twenty years we should lead the world in medical illustrations. Any man writing a text-book scans the literature for good illustrations and would naturally select those from this country. This would carry American illustrations to all parts of the globe and greatly redound to the credit of American medicine. With fear and trepidation I laid the plan before a broad-minded and liberal business man, who promised $5000 a year for three years to see if the plan would prove a success. It was a success, and at the end of the three years he consented to support it for two years more. Last February he again consented to supply funds for three more years. The last annual report of the Department of Art in Medicine, as sent to the donor and to Dr. Frank Goodnow, president of the Johns Hop-

kins University by Mr. Broedel, the director, showed that artists had been trained and sent to Boston, New Haven, Philadelphia, Sayre, Pa.; Baltimore, Richmond, Cleveland, Chicago, Rochester, Minn.; St. Louis, El Paso, and San Francisco. At the present time Mr. Broedel has sixteen artists in training.

I have dwelt at some length on this subject because some of you may know of artists who wish to take up medical illustrating as their vocation, and also in order that you may appreciate what advances in this branch are being made in this country. I may say that the spare time of the director and his pupils is taken up in making illustrations for publications emanating from the Johns Hopkins Hospital and the Johns Hopkins Medical School. Nothing would afford me greater pleasure than to furnish you the name of the man who has given the $40,000 for the maintenance of this department—a work that is doing so much to enhance the appearance and value of American medical publications and that will have an ever-increasing influence in the future; but the money was given anonymously and the modest donor refuses to let his name be known.

The Anesthetic. Until the last decade the administration of the anesthetic was left largely to the junior interne. Consequently, at the beginning of the scholastic year the surgeon was greatly hampered in his work until this assistant had gradually gained sufficient experience to enable him to give the anesthetic fairly well. This defect was a great handicap to the operator, and, what is far more important, was very harmful to the patients. This slipshod method of putting patients to sleep was a glaring defect in American surgery. At the present time many of the larger and some of the smaller institutions employ expert anesthetists—men who do nothing else. That the profession is aroused to the need is evidenced by the large number of papers written on the subject. I would call your attention

to the proceedings of the American Association of Anesthetists as published in the October number of the *American Journal of Surgery.*

For nearly twenty years Dr. S. Griffith Davis, one of the most expert anesthetists in the country, has put the majority of my patients to sleep. At the operating table I have been able to devote my entire attention to the operation, knowing full well that if any untoward symptoms arose I should be notified at once. These patients were, as a rule, given just enough of the anesthetic to keep them asleep, and consequently they would wake up a short time after the completion of the operation. Furthermore, their period of nausea was usually much shortened.

Every interne during his first fifty cases should be under the direct guidance of an expert anesthetist, and I feel sure that the time is speedily coming when all patients, except in emergency cases in outlying districts, will be put to sleep by specially trained men. How many of us will be satisfied with an inexperienced man when our turn comes to lie on the operating table? One and all of us will demand, above all things, the best anesthetist obtainable. The universal employment of the trained anesthetist will not only give the surgeon peace of mind, but will materially increase our percentage of recoveries.

Cancer. Much has been written and said about cancer, but we are only just at the threshold of the campaign. In the advanced cases we can recognize it clinically and in the early cases diagnose it from the examination of portions under the microscope. Fifty years ago practically all malignant growths except skin cancers were fatal. Now we know that a certain percentage of lip, stomach, intestinal, uterine, and other cancers can be cured. Our percentage of cures has improved with our improved technic. Our next step is to reach the cases early.

The Cancer Campaign Committee of the Clinical Con-

gress of Surgeons enlisted the services of that forceful and lucid writer, Samuel Hopkins Adams. He gave us a two-page article in the *Ladies' Home Journal* and followed it up with similar articles in *Collier's* and *McClure's*. These articles were copied or epitomized by many of the newspapers throughout the country. The immediate effect on the people throughout the United States was marked, and many people with early carcinoma went to their family physician of their own accord. One member of this Association told me that as a result of the *Ladies' Home Journal* article alone he had seen six early cases of cancer.

The Cancer Committee of the American Medical Association has also done much in disseminating pamphlets on the more common forms of cancer. Just here I should like to draw your attention to the many spheres of activity of the Council of the American Medical Association. This has been one of the most important committees ever organized in the United States, and has done wonders looking toward the betterment of American medicine and surgery. Any one who has sat in the House of Delegates of the American Medical Association and has listened to the various reports of this committee as read by its indefatigable secretary, Dr. Frederick R. Green, must have been amazed at the fundamental plans which the committee has not only outlined but has also successfully carried out.

The American Society for the Control of Cancer, a society supported in large measure by the laity, has been and is now doing yeoman work in disseminating information relative to the early diagnosis of cancer. Mr. Curtis E. Lakeman* is the executive secretary. If any member of this Association has at any time data that he thinks will prove of value in the diffusion of knowledge concerning cancer he will be greatly aiding the cause by communicat-

* Mr. Lakeman's address is 25 West Forty-fifth Street, New York.

ing with Mr. Lakeman, who will soon see that this information, if it proves suitable, is widely disseminated.

Many people already have been enlightened as to what may be accomplished if a cancer is operated upon early. All the patients must be reached while the disease is still in the incipient stage. When this knowledge is widespread our results in cancer cases will be much better than they are today.

Radium. The use of radium is still in its infancy. You and I know little or nothing about it, but fortunately a few of the physicians in America have enough to try it out and to find what may be accomplished by its use. At the present time I think all are agreed that whenever a case is operable the growth should be removed with the knife, and that radium should be employed afterward in suitable cases.

In our surgically inoperable cases we know that every patient must eventually die of the disease. If the radium expert treats all these he will undoubtedly lose a large percentage. Some of us are prone to call these failures, but this is hardly fair. We should ask what percentage of success he has been able to attain where we have absolutely failed. If he cures 10 in 100 of those we have sent away as inoperable and left to die he has accomplished a great deal, although he may have been able to do little or nothing for the remaining 90. Some of our inoperable cases can be cured at least clinically; others can be temporarily relieved of their pain and discharge.

We as a nation should be thankful that we have enthusiastic members of the profession who are not only willing to spend a great deal of money but also devote most of their time in attempting to relieve a group of cases that are beyond surgical aid. I cannot refrain from briefly mentioning a case that came under my care in March of this year.

A woman, aged fifty-two, was admitted to the Church Home and Infirmary, Baltimore, with a supposed uterine myoma. On examination I found a globular tumor filling the pelvis and extending to the umbilicus. The glands in both groins were enlarged and nodular. In both axillæ were nodules. In the right axilla was a nodule about 4 cms. in diameter. A few days later numerous small shot-like or pea-like nodules could be felt along the legs and arms. I hesitated for a long time and finally decided to do nothing. The family was so insistent that I eventually consented to explore the abdomen to see if the patient could be temporarily relieved. The pelvis was filled with a large mass, globular, and so fixed that the pelvic organs could not be outlined. Occupying the right side of the abdomen and firmly adherent to the large pelvic tumor was a second tumor about 12 cms. in diameter; many omental vessels ran directly into it. The omentum was studded with small oval nodules having sharp edges. I removed some of the omentum and closed the abdomen.

Microscopic examination of the omental nodules showed lymphosarcoma, and I told the family that nothing further could be done. The patient had a quaint little girl of four who was wrapped up in her mother, and I could not get away from the thought of the tragedy in store for the child. Grasping at a straw I rang up my friend Burnam, gave him the details of the case, and asked him if anything could be done. He said he would try, and he did. The patient was given applications of radium at twenty-one different points, extending over a period of eleven hours. She was greatly shocked, but gradually recovered. I examined this patient a few days ago. There was absolutely no trace of the abdominal or pelvic growth, and I could outline with the utmost ease the pelvic structures which seemed to be perfectly normal. The inguinal regions were normal. No tumors were palpable in the axillæ, and all of the small

nodules had disappeared from the legs and arms. Her only complaint was a slight diarrhea.

It may be that the growths will return, but that remains to be seen.* They are not there now, and if the patient remains, well, say for a year, how much do you think that means to her little daughter and to the family? It is a year that neither you nor I could add by means of any surgical operation.

At the present time we know of at least three good things that radium has done.

1. It has apparently cured a percentage of surgically inoperable cancer and sarcoma cases.

2. It has prolonged life in others.

3. It has relieved the pain and done away with or mitigated distressing discharges in not a few. In other words, it has done enough to make us feel that we would want to have it tried on any member of our family that had an inoperable growth.

Post-Graduate Work and Vacations. I know of no other country where the surgical profession as a whole goes a' visiting more than in America. And the interesting point is that no matter where the surgeon may go he is always welcome and is shown everything of interest in the various clinics. The American surgeon realizes that he does not know everything, and that in nearly every clinic

* On January 2, 1917, I saw this patient again. On abdominal examination a slight thickening could be made out in the right lower abdomen in the region of the cecum. This area was very sensitive. On bimanual examination a mass about 10 cms. in diameter could be detected just posterior to the uterus, and on rectal examination I could feel polypoid masses projecting into the bowel. The mucosa over these polypi was everywhere intact and the lumen of the bowel did not seem diminished in calibre. There was no doubt that there was a return of the growth and that this projected into the bowel from the outside. I advised the immediate use of radium.

April 24, 1917. Dr. Curtis F. Burnam informs me that at the present time there is absolutely no evidence of any abdominal or pelvic growth.

he will find some valuable points to add to his store of knowledge no matter how rich.

The American Medical Association, the Southern Medical Association, and the Clinical Congress of Surgeons at their meetings offer ample oportunity for the men to become well acquainted with one another. The individual members feel proud of the fact that their country contains in its medical ranks so many conscientious, capable, and really brilliant men, and that their profession is continually striving for the betterment of the lives of the people of the United States. These meetings so knit the north and south and east and west that America becomes for the time being in reality a very small community. Much of permanent surgical value is gleaned at these meetings, but still more important are the many friendships formed and the pleasant memories that prove a continual source of stimulus during the subsequent months and years. In the smaller and more limited surgical bodies, such as the Southern Surgical Association, the members become even better acquainted; there is a warm feeling of comradeship, and I know that in this Association each member feels that he is in reality a member of one large family, and that every other member is a real brother. These smaller societies yield less to outside attractions, and consequently concentrate their attention on the scientific program and on the social functions arranged for them and their families. I have ample reason to know that in this Association the members each year look forward with added eagerness to the annual meeting, when they will again have the pleasure of meeting those who have become their lifelong friends.

The smaller interurban clubs which meet two or more times a year and spend a day or two at some surgical center are also of great value. A great deal of surgical work is collected for these meetings, and one is thus enabled in a short time to see more than he could ordinarily do in a

week or even two. The tendency to visit surgical clinics is rapidly increasing, the visitors coming not only from our own country but also from abroad. This is a clear indication of the confidence in which American surgery is held. Undoubtedly more visitors go to the Mayo Clinic than to any other in the world. Built up by the indefatigable energy of William J. and Charles H. Mayo, this wonderful clinic has added greatly to the prestige of American surgery, and is an achievement of which the profession of the United States may well be proud. The dropping in to see what our colleagues are doing through the length and breadth of the land is bound to have a tremendous influence on the development of American surgery. The surgeons of this country as a whole have vision enough to see that regular vacations are essential to good work. The operator cannot regulate his work by the eight-hour standard and must frequently toil long overtime if he is to accomplish his task satisfactorily. If he continues to do this indefinitely he will lose not only his elasticity but also the keenness of his surgical judgment. The surgeon in many ways resembles the railroad engineer. He must always be on the alert for his passengers, and in case of danger must often act with instant decision. Unless he takes the necessary vacation he will either wear out or become a mere drudge. It is hard for any of us to realize that the world can move along serenely without us—but it can. Take plenty of vacation. One can do more and better work in nine months of the year than one can accomplish in twelve months. It does a man an immense amount of good to get away from the intensive work that has been absorbing his attention for months—that has made him totally oblivious to what has taken place around him—and to completely forget it for a few weeks. In the meantime he can view his work from the distance, get a true perspective, see where he can improve his work, and return with an added

zest to his labors. If you wish to do your maximal amount of good work you must take at least a two months' vacation each year.

While in a retrospective mood let us consider two points in which we can improve: Some American surgeons when publishing papers quote freely the French, German, or English authorities, but apparently fail to realize that anything worthy of note has been done by their American colleagues. Sometimes they even completely ignore excellent work done by surgeons in their own cities. Let us avoid this brand of provincialism or "highbrowism," for that is what it amounts to. Let our prophets in our own country come in for their just share of credit and place American surgery just where it belongs!

There is another group of very competent men who do nothing themselves, look wise, and continually criticise and "knock." They are like the Irishman who was always "agin the Government." It is our duty to evolve means whereby the energy of these "knockers" may be diverted into the right channels. If it cannot be accomplished otherwise they should be assigned surgical problems or be given responsible positions which will require so much labor and energy that they will have little or none left for "knocking." They will also soon realize from experience that any man who accomplishes much is bound to make some mistakes, and will learn to be more charitable in their attitude. Just criticism is desirable and very useful. "Knocking" hurts the fault-finder and also tends to belittle the profession to which he belongs. There is no room for useless fault-finding in the wonderful advance in American surgery.

The Training of the Surgeon. The father who has had a poor preliminary education, but who has nevertheless forged to the front, is anxious that his son shall have the best education obtainable. We as surgeons should see that

the coming generation, the men who are to take our places, have the best possible training.

Two essentials are necessary, a good preliminary training and the best possible medical course. The leaders in the United States have been fully alive to the situation. An editorial entitled "Medical Education—a Sixteen Years' Successful Campaign," appeared in the *Journal of the American Medical Association,* August 19, 1916. This gives in a nutshell the wonderful progress that has been made.

In 1900 the *Journal* began collecting statistics relative to medical colleges, students, and graduates, and in 1901 a beginning was made in the great campaign for the improvement of medical education. In 1904 the American Medical Association created the Council on Medical Education under the chairmanship of Dr. Arthur Dean Bevan and by 1906 its work was well under way. By 1907 the council had a complete list of foreign medical colleges, and it was found that there were more medical schools in the United States than in all the other countries of the world put together.

Later, tours of inspection were made to all medical schools in the United States and a definite campaign waged to merge medical schools where two or more existed in one city. This campaign bore excellent fruit, and by 1910 the number of medical schools had been reduced from 162 to 131. Meanwhile, as stated: "Many of the institutions had undergone a remarkable internal development. Better teachers had been employed, better buildings erected, new laboratories established, and better clinical facilities secured. Furthermore, a remarkable improvement had been made in entrance standards."

From 1910 to 1915 the general study of medical education had been continued, and during this period the number of medical schools had been further reduced from 131 to

95. Moreover, 88 per cent. of these had adopted higher entrance requirements. The editorial further says that the continuous agitation for better conditions in medical education had appealed to philanthropists to such an extent that endowments for medical education had been greatly increased, and large gifts for medical buildings, new laboratories, scholarships, endowed chairs, and teaching hospitals had become of frequent occurrence. From the *Journal* we also learn that "this country already has a score or more of medical schools which in every particular are equal, if not superior, to those to be found in any other country."

To those of you who are specially interested in medical education I would commend a thorough study of the report of the twelfth annual conference of the Council on Medical Education of the American Medical Association held in Chicago in February, 1916. To surgeons the article by Dr. Elias P. Lyon on "The Relation of the Laboratory Courses to the Work of the Clinical Years" and the address by Dr. Lewellys F. Barker on "The Relation of the Preclinical Laboratory Courses to the Work of the Clinical Years" will be particularly instructive.

I have dwelt at length on the splendid work done by the Council of the American Medical Association in order that you may see that the medical teachers of this country are doing everything in their power to give the medical students of the United States the best possible training. In this connection I may mention a fact that is not yet generally known, that a somewhat similar attempt to standardize hospitals is being made by the American College of Surgeons in coöperation with the American Hospital Association and the Carnegie Institution.

The medical student who after graduation decides to make surgery his life work should not take up his chosen specialty at once but should spend at least one year in a

strictly medical service. A broad foundation in general medicine is absolutely essential. The following year can be most profitably spent in the pathological laboratory in making autopsies, studying diseases from the gross and histological standpoints, and cultivating the bacterial flora associated with them. After this he should become a surgical interne under a competent surgeon. His time will now be occupied in taking histories, assisting at operations, and in the after-care of patients. He will also have ample opportunity for studying all tissues coming from the operating-room. He thus has a complete picture of the patient's condition from the time of admission until his discharge, and from the laboratory findings has a clear idea as to the ultimate prognosis of the case.

After he has assisted from one to two years he is allowed to perform the simpler operations, and by the end of the second or third year he is competent to handle the more difficult cases. After a year or two as resident surgeon he is amply fitted to start out as a full-fledged surgeon, with the definite knowledge on the part of the hospital that he will be a credit to the school and to the institution from which he has come. I fully realize that many men are so hampered financially that these long years of study are almost out of the question, and yet "where there is a will there is a way" is usually found true, as many of us most vividly remember.

A lack of the knowledge of pathology is the weakest point in American surgery today. When most of us graduated there was no adequate training in either pathology or bacteriology. We have been forced to learn the basic principles of bacteriology in order that our surgical technic might be up to the standard, but we have never had the time or patience to get a comprehensive knowledge of surgical pathology. As the surgeon grows older his time is more and more occupied and his opportunities for the study of

pathology become less and less. It is our duty, however, to see that every piece of tissue that comes from the operating room is carefully examined histologically by a competent pathologist. In this way the final diagnosis of each case is reduced to a concrete basis. Now and again we shall find a carcinoma of the appendix where merely a chronic inflammation was suspected, tuberculosis of the tube where a simple salpingitis was deemed certain, and sarcomatous degeneration of a myoma which at the operating table we had thought was a simple myoma undergoing hyaline degeneration. The surgeon of today in the majority of instances must rely on the verdict of the pathologist. The surgeon of the future must be an expert pathologist himself if he is to do his duty to the patient and if America is to take its proper place in the surgery of the world. If we are thoroughly familiar with surgical pathology, gross and histological, we can, on opening the abdomen, usually at once recognize the condition present. If we have little or no knowledge of pathological conditions, however, and if no pathologist be present, we shall often be at a loss as to what should be done. Sometimes we may cut out a piece of the diseased area for microscopic examination and then close the abdomen. In other cases we may venture to complete the operation, although still doubtful whether we should have attempted the complete enucleation or whether it would have been better to have left well enough alone. If the surgeon is a good pathologist a glance will often give the clue, and if he be still in doubt an assistant can at once make a frozen section and a glance at the slide will give us a positive diagnosis. I cannot too strongly emphasize the absolute necessity for us to be up and doing in the study of surgical pathology—a subject still greatly neglected in America. To practise surgery without an adequate knowledge of surgical pathology is like building upon the sand. No great building can be erected without good foundations.

No surgical career will reach its maximal fulfilment without that bed-rock foundation—surgical pathology. I know how difficult it is to find enough pathologists, the supply even now cannot keep up with the demand. Let me give you the plan adopted by the medical society of Waterloo, Iowa, a city of 30,000. The physicians clubbed together, rented suitable quarters, and placed Dr. Guthrie McConnell, a well-known pathologist, at its head. In this laboratory all pathological material is examined and all the examinations usually made in any clinical laboratory are carried out. The entire medical profession of the city have therefore a laboratory at their disposal, a laboratory to which patients are sent for various tests and where thoroughly trustworthy reports can be obtained. The society is most enthusiastic over the splendid results obtained in their own laboratory. In a small city or town there is absolutely no reason why two or three surgeons should not club together, fit up a laboratory, and engage a competent pathologist at a good salary to examine every specimen for them. They will thus do more for their patients and at the same time will find added pleasure in their surgical work.

For the young surgeon who after leaving the hospital still feels that he would like to perfect himself further, the many experimental problems in the Hunterian laboratories are most fascinating and profitable; and we in this country are greatly blessed in having such splendid institutions as the Rockefeller Institute and the Rockefeller Hospital, where especially promising men find ample opportunity for carrying on their work under the able guidance and coöperation of Dr. Simon Flexner and Dr. Rufus Cole.

How many of us know that the most extensive and most valuable collection of embryos in the world exists in the United States, and that the majority of these have already been cut into serial sections, and are available to us for careful study. We owe this collection to the foresight and

untiring industry of Dr. Franklin P. Mall, who from the time he came to the Johns Hopkins Medical School as its professor of anatomy at the opening of the school in 1893 has been collecting, sectioning, tabulating, and studying all the available embryos. Dr. Mall is also director of the laboratory for research in embryology recently established by the Carnegie Institution and located in Baltimore. If you or I have some surgical problem that is difficult of explanation and the solution of which can be attained only by a study of embryology we can go to Dr. Mall, feeling perfectly sure that he will not only give us every facility for study but that he will place the necessary and, I might say, priceless sections at our command. We can in this collection speedily see more examples of a given type than we could ourselves collect in three or four lifetimes. This laboratory will be the Mecca to which the many students, both medical and surgical, seeking enlightenment along obscure embryological points will come. This is another advance of which America may be justly proud.

At this point allow me to digress and for a few moments consider our own society. The founders of this society builded wisely and we can see a marked improvement each year. This advance is in large measure due to our quiet, energetic, and sagacious secretary, Dr. William D. Haggard. His personality is so completely wrapped up in the welfare of the Southern Surgical Association that, when thinking of the society, one instinctively thinks of him.

After trying to analyze the secret of the success of this society I have come to the conclusion that its method of organization, namely, the divorcing of the scientific from the business sessions, has been an important factor. Then it seems that all of our members who take part in the proceedings aim to save their best work for these gatherings. But the most important of all is the fact that in the selection of the members such great care has been exercised that there

is rarely, if ever, a discordant note. This society is really the clearing house for the year's work, and the stimulus obtained at these meetings is of lasting value. If the councils in the future select as wisely as they have done in the past, this Association will have an ever increasing sphere of usefulness. Dr. Haggard has very wisely had copies of the *Transactions* sent each year to the leading libraries of the world. I think we might with profit distribute at least one hundred more to the smaller medical libraries in this country and abroad.

Obituary. Since our last meeting the labors of three of our number have ceased. Dr. Joseph A. Gale, of Roanoke, Virginia, chief surgeon of the Norfolk and Western Railroad and a former president of the Medical Society of Virginia, having passed his three-score years and ten, died on July 6, 1916, at the age of seventy-four years.

Most of us can enter or leave a meeting without being noticed; but there was one tall and striking member of our society who instantly commanded attention the moment he entered any meeting, and when he spoke his rapid flow of words reminded one of a Gatling gun. His method of teaching was graphic and telling; his operating fascinated the many visitors to his clinic. We can hardly realize that the indefatigable worker, the man that has done so much to advance American surgery, is with us no more. That genial and warm-hearted Irishman, that great surgeon, John B. Murphy, will always stand out as one of the great surgical landmarks of this generation. I am glad that Dr. Crile will tonight give you an intimate and extended view of his career.

We have lost another distinguished surgeon who for many years was active in this Association. Dr. Louis McLane Tiffany died suddenly at his country home, Mount Custis, Accomack Court House, Virginia, on October 23, 1916, at the age of seventy-two years. Dr. Tiffany was a

graduate of the University of Cambridge, England, and of the University of Maryland. From 1874 to 1880 he was professor of operative surgery in his alma mater and from 1880 to 1902 occupied the chair of surgery. For years he was a consulting surgeon to the Johns Hopkins Hospital. In 1902 he retired from active duty with the title of emeritus professor. Dr. Tiffany was a man of rare personality and charm and was continually going out of his way to make smooth the paths of young surgeons. Let me give you a personal experience: Some twenty years ago Dr. Tiffany rang me up and asked me to meet him at the Church Home and Infirmary at two o'clock. I went there at the appointed hour and found him doing a complete breast operation. He turned to me and said: "This patient also needs an abdominal operation, and I want you to do it." Needless to say he could have done the abdominal operation better than I could, but he insisted on my doing it, and he stood by quietly holding the electric light until I had finished my part. His sole object was to express his confidence in a young surgeon just starting on his career. It was a kindness that I shall never forget.

Dr. Tiffany was not only a brilliant diagnostician and operator but was also continually working to improve and broaden the sphere of American surgery. He was one of the first in America to remove successfully a tumor of the liver. This case was reported in the *Maryland Medical Journal,* 1890, xxiii, 531. The high esteem in which Dr. Tiffany was held is indicated by the fact that he was president of the Southern Surgical and Gynecological Association and of the American Surgical Association during the same year, 1895.

The memory of Louis McLane Tiffany will long be cherished not only in Maryland but also throughout the United States.

In my address this evening I have not only endeavored

to sketch for you the gradual improvements that have taken place in American surgery, but have also pointed out how much we owe to the other professions that are so closely allied to surgery.

President Wilson in an address delivered in Baltimore on September 25, 1916, after referring to the wonderful resources of the United States, said: "We had, as it were, deliberately refrained from playing our part in the field in which we prided ourselves that we were most ambitious and most expert—the field of manufacture and commerce. All that is past, and the scene has been changed by the events of the last two years, almost suddenly and with a completeness that almost daunts the planning mind. Not only when this war is over, but now America has her place in the world, and must take her place in the world of finance and commerce upon a scale that she never dreamed of before.

"My dream is that she will take her place in that great field in a new spirit which the world has never seen before; not in the spirit of those who would exclude others, but the spirit of those who would excel others. I want to see America pitted against the world, not in selfishness, but in brains."

What applies to the field of manufacture and commerce applies equally well to surgery. For several years the straws have been indicating the trend of affairs. The American requiring surgical treatment no longer goes abroad to be operated upon but prefers to be treated in his native land; and the American surgeon himself, when taken ill abroad, strains every effort to get home and be operated upon by one of his confrères. These two points in themselves supply the most eloquent tribute that can be paid to American surgery.

From this evening's consideration of the status of American surgery we have gleaned several very important

facts. We have vast sums invested in the hospitals of this country and the hospital authorities are making every effort to bring their institutions up to the highest standards of efficiency. Our nurses are vastly superior to those of any other country. We are improving and increasing our medical libraries, and the library of the Surgeon General, to which we all have access, is the most easily available, and the most valuable in existence. We have an abundance of excellent medical journals. We have the only department of art in medicine in the world, a department which in the course of a few years will enable all the leading medical centers to have competent medical artists. We have for years had committees actively working not only to find out how our medical teaching may be improved, but actually raising the standards of our medical schools. We have a sturdy and intelligent class of medical students of whom any land might be proud. We have taken the public into our confidence and are educating them as to what can be accomplished when tuberculosis and cancer are recognized early. Above all, we are raising the standards of the surgeon himself.

The great advances made in American surgery are the consequence not of any mushroom growth but of the steady and irresistible progress that was bound to follow the carefully laid plans of the last twenty years. If we look into the past we shall find that one country after another has forged to the front and assumed the leadership, only to be outdistanced by another after a decade or two. We in America have profited greatly by the rich streams of medical knowledge that have been flowing to these shores ever since these United States were founded, and many of us have had the privilege of studying in the medical centers of Europe. Are we capable of doing for the countries across the sea what they have done for us? We have an unrivaled equipment, our surgery is unex-

celled and our scientific work if based on a fundamental knowledge of pathology, cannot be surpassed. Let us keep the light burning brightly during this long and pitiless war. When the great European nations are again at peace have have laid down their arms, they will find among their Aesculapian armies, a new and powerful member, one that is equal to any of them, one that is eager and ready to join them in another war, a war that will make glad the heart of every nation on this earth—a war not of destruction, but one destined to lessen materially the sufferings of humanity and to lengthen the span of human life.

GIANT-CELL EPULIS OF UPPER JAW

By Francis Reder, M.D.
St. Louis, Mo.

An epulis is a tumor of the gum with a suspicion. It is the most frequent of oral tumors. Its subdivision into fibroma and giant-cell sarcoma characterizes it as a borderline lesion. Both the fibroma and the giant-cell sarcoma spring from the dental periosteum of the alveolar process or the connective tissue between the bone of the alveolar border and the mucous membrane of the gum surrounding the teeth (Bloodgood), either outside or inside the alveolus.

An epulis may also find its origin in the interior of a diseased tooth socket. Almost any part of the alveolar ridge may prove a suitable nidus for the development of this growth, a preference, however, being shown for the canine region over the bicuspid, the bicuspid over the first molar, and the first molar over the incisor (Scudder).

The variety of epulis known as a fibroma consists entirely of fibrous tissue. It is not a very vascular tumor, and is usually of small size, projecting between two teeth. It is well circumscribed.

Its growth is slow, and the mucous membrane covering the tumor is usually normal in appearance. A fibroma does not metastasize, nor does it appear to possess the definite characteristics of malignancy, excepting for the suspicious action of recurring locally if not completely

excised. If such a tumor is allowed to grow, ulceration and necrosis from pressure of the teeth will eventually occur.

The giant-cell sarcomatous epulis presents a somewhat different clinical picture. However, it has some characteristics in common with the fibroma, namely, it rarely metastasizes, and usually remains a local lesion confined to the alveolar process until it is meddled with surgically. Any surgical measure that will fail in a successful excision will cause the tumor to recur, often with surprising promptness. Under such conditions it is prone to form metastases. Although the tendency to glandular enlargement and to form distant growths is rather remote, a fact which robs it of the true character of a malignant neoplasm, its rapid and destructive growth compels it to be classified with the malignant types of sarcoma.

A malignant epulis, having a broad but more often a narrow attachment, usually appears at the edge of the teeth as a red, soft, and irregularly rounded mass. The deep pigmentation which characterizes this mass is caused by its great vascularity. It is, therefore, not surprising that these tumors bleed easily upon slight trauma.

The appearance of the mucous membrane in the immediate vicinity of a giant-cell epulis gives little or no evidence of any infiltration. However, if the growth should have its seat in the alveolar ridge of the upper jaw the likelihood of an infiltration involving the soft structures of the hard palate is not improbable. Very rarely is there an invasion of the bone by such a growth.

The consistency of a giant-cell epulis is not uniform. Although it imparts a spongy feeling throughout, certain parts of the tumor appear hard while others seem soft. In palpating such a tumor the sensation of touching a mass of granulation tissue is forcibly brought to mind.

A malignant epulis does not cause pain, excepting dur-

ing during the formation period, when it is not easily recognized and is often mistaken for a "gum boil." At that period a toothache or a neuralgic pain, for which the patient may or may not seek relief from a physician, is the only discomfort experienced. The contact of the tumor with the neighboring structures (excepting the teeth, which are often pushed out of their sockets) does not in any way affect them.

Through its size an unsightly protrusion of the lip may be occasioned. The sulcus between lip and jaw and that between cheek and jaw retain their normal anatomical characteristics. The well-being of an individual suffering with an epulis is not unfavorably influenced unless the size and location of the tumor interferes seriously with the partaking of food. Such tumors rarely ulcerate. Should ulceration occur it is more likely to be caused by pressure than by infiltration.

On account of the great vascularity of a malignant epulis, obstinate bleeding often takes place; it, however, never assumes the character of a hemorrhage.

An epulis shows no predilection either for the upper or lower jaw, both jaws being equally liable to the disease.

Women seem to be more prone to the disease than men, the ratio being about one to two.

Age appears to have some influence, the lesion appearing usually during childhood and young adult life.

The prognosis of an epulis when the proper surgical measure has been carried out is good. The fibrous epulis when thoroughly removed never returns. The giant-cell variety, however, shows a marked tendency to recur, and only then can the greatest promise of a cure be obtained when the growth, together with the alveolar border, has been removed.

Unfortunately the term "sarcoma," so often used in emphasizing the nature of a giant-cell epulis, has been

Fig. 1 Fig. 2 Fig. 3 Fig. 4

Fig. 1.—Giant-cell epulis of upper jaw.
Fig. 2.—Same case, lateral view.
Fig. 3.—Same patient after operation, showing restoration of mouth.
Fig. 4.—Same patient, showing the security with which she can wear a palate plate with teeth.

responsible for much heroic operative work on the jaw, some of it perhaps necessary and some of it perhaps needless. In all lesions of a suspicious nature, however, it is a great satisfaction to know that the work of eradication has been carried well into the normal tissue. In quoting some statistics, 18 cases at the Heidelberg clinic, according to Wassermann, resulted in 15 cures and 3 recurrences. Gunzert reports 38 cases—35 well and 3 recurrences, one death from metastatic sarcoma of the brain following extirpation of fibrosarcomatous epulis of the jaw. According to Bloodgood, of 40 operations for epulis at Johns Hopkins Hospital Clinic, all have remained well including the recurrent cases (Scudder).

The case of giant-cell epulis of the upper jaw that I wish to present is that of a woman aged fifty-two years. She is the wife of a farmer, has never had any serious illness, and is quite stout.

One morning in March, 1913, while opening the chicken house, a hen flew into her face, striking her in the mouth, and causing several teeth in the upper jaw to be loosened.

About a month later she had a bad toothache. The ache continued. She consulted a dentist, who extracted the tooth. This gave prompt relief.

About two weeks after the tooth was extracted she noticed a swelling about her upper gum "near the right eye tooth." A physician diagnosed it as a "gum boil" and lanced it. The "gum boil" did not disappear but slowly continued to grow. Inasmuch as it was not painful she tried to forget it.

About six months later, however, the growth had assumed such proportions that she went to a physician, who treated it. The tumor then was occupying the greater part of the gum of the upper jaw. Most of the teeth had become so loosened that they either dropped out or were easily extracted. The mass was cut away twice by the

physician within a month. After that it was freely cauterized with nitrate of silver. Within two weeks the growth had returned and was growing rapidly.

When I saw the patient in December, 1913, she was very much depressed over her condition. Her anxiety had robbed her of much sleep. She was only able to take food in liquid form. Her general health began to suffer.

Examination of the mouth revealed a venous-colored, spongy mass about the size of a small tangerine attached to the alveolar border of the uper jaw. It presented projections and irregularities on the surface and extended on to the hard palate, protruding under the upper lip, which it pushed upward and outward.

The mucous membrane of the alveolus was thickened, somewhat soft, and quite red. The teeth of the upper jaw were all missing, having been lost during the growth of the tumor. The sulcus between lip and alveolar border was normal. No fetid discharge was present and the mass looked clean.

The lower jaw possessed most of its teeth, all in a poor state of preservation.

In removing the tumor the incision was made through the mucous membrane, quite free of the tumor. With a chisel the whole of the alveolar border of the upper jaw was removed. Bleeding was very free. It was, however, readily controlled by pressure.

The patient suffered no untoward effect from the operation, and made a quick recovery, nothing unusual happening during the healing process. Four months later she was able to be fitted with a palate plate with teeth, which she is wearing with comfort.

It is now three years since the tumor has been removed. There is at present no evidence of any recurrence.

THE BIOCHEMISTRY OF TOPICAL APPLICATIONS, WITH SPECIAL REFERENCES TO THE USE OF BORIC ACID IN SEPTIC INFECTIONS[1]

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It is a generally accepted psychological fact that early experiences attract our attention most and consequently make the most lasting impressions. When the writer was a country school-teacher, he became acquainted with a bright young country practitioner. Four years later while visiting the Presbyterian Hospital in Chicago, he accidentally met this same physician as a patient in that institution, suffering from a septic infection of the left upper extremity. A few weeks ago I asked him for a brief history of his case, of which the following is an abstract:

In March, 1890, he ran a sliver into his finger, and a few minutes later extracted a bad tooth for a patient. In the course of a few days the finger became painful. He went to a fellow practitioner who excised the inflamed area with shears. The finger enlarged to three times its normal size, the entire hand and arm became markedly swollen, the glands in the axilla enlarged to the size of walnuts and the patient was in great agony for a number of days and nights. A consultation was called and the consultants both advised amputation of the arm. The physician instead took the first train to Chicago and placed himself under the care of his former teacher, Prof. Chas. T. Parks, who applied large wet dress-

ings of boric acid. In less than twenty-four hours the patient went to sleep and was able to leave the hospital on the sixth day.

I saw him at the hospital the day he left for home, and a happier and more grateful patient I have never seen, and well he might be, for not only his arm, but probably his life, had been saved by this simple treatment.

As I was at the time in my junior premedical year at college with a mind keen and eager for medical knowledge, but not yet surfeited with medical facts, it made a deep and lasting impression upon me. When I became a medical student, I naturally supposed that every teacher was using boric acid for septic infections, but to my great surprise I noticed a marked difference in the teachings of the older and younger faculty members in reference to all topical applications. This same difference was also noted in the older and newer text-books. The older professors as well as the older text-books mentioned and lauded a great variety of poultices and wet dressings and the younger faculty members and the newer text-books almost invariably ridiculed such methods of treatment.

It occurred to me even as a student that there must be some reason for such marked difference of opinion and as soon as I became an interne at the Cook County Hospital I attempted as far as possible to test out the claims of each faction. Being young myself, my sympathies naturally were with the younger faculty members and my first impression was that what value there was in poultices and wet dressings could be explained on the basis of the application of heat and moisture, but somehow I could not forget the experience of my physician friend, related above, and I furthermore soon made the discovery that two wet dressings of different composition acted differently. I tried out the various dressings then in vogue, such as dilute solution of bichloride of mercury, carbolic acid, Thiersch solution and boric acid in various strengths, as well as different combinations.

Fortunately at this stage of my investigations, I came across a statement in an early edition of Treaves's *Operative Surgery,* viz., that boric acid is only effective as a wet dressing in inflammatory conditions if applied as a saturated solution, and I was very soon convinced of the correctness of this statement. If a case of cellulitis, for instance, was treated with a 2 per cent. solution of boric acid in water, the skin soon became water-logged, sticky and unhealthy-looking, and the patient did not progress favorably, while if a saturated solution was employed the skin soon took on a healthy appearance and the local as well as the general condition began to improve. While prosecuting this study and making these observations the late Prof. W. W. Daniells, then Head of the Department of Chemistry of the University of Wisconsin, did me the honor of spending a day with me at the County Hospital and showed great interest in my work along this line.

After I became thoroughly convinced that my observation as to the efficacy of boric acid as a wet dressing was correct, I became curious to know why it was effective and why a saturated solution was much more effective than an unsaturated one. I then took up the study of Osmosis and Dialysis and the meaning of the words "iso-osmotic" and "isotonic." I soon came to the conclusion, however, that these terms were being very loosely employed in the literature, that no two writers used them exactly in the same sense, and I became further convinced that the laws of physics dealing with dialysis and osmosis were probably based on insufficient experimental data and were consequently incorrect. At this stage of my experiments I remembered the interest my old teacher, Professor Daniells, had shown in my investigations and I naturally turned to him for assistance and advice. He referred me to one of his assistants, Prof. Louis Kahlenberg, whose specialty at that time was physical chemistry and who now is Head of the Department of Chemistry of the University of Wisconsin. Prof. Kahlenberg

made a great number of experiments in order to determine the laws which govern osmosis and dialysis, and after several months of study and experimentation corroborated my suspicion that the laws, as heretofore stated in works upon this subject, did not accurately state the facts.

As I am going to quote rather extensively from Prof. Kahlenberg's monograph *On the Nature of the Process of Osmosis and Osmotic Pressure with Observations Concerning Dialysis,* and from our correspondence, I deem it but fair to him as well as to myself to make these preliminary statements.

Prof. Kahlenberg's experiments and observations covered a period of several years, were very painstaking, thorough and extensive and he has been so fortunate as to work the whole matter out, put the whole subject on a secure scientific basis and to formulate new and tenable laws in reference to osmosis and dialysis. Among other things, he has proved: (1) That the physical theories of osmosis, according to which osmotic pressure, so called, was due to the bombardment of a semipermeable membrane by dissolved molecules is not true. Thus, for instance, it was found that membranes heretofore considered impermeable were really very permeable to certain substances. (2) That osmosis and dialysis are really chemical processes depending upon the differences in chemical affinities different substances have for each other. (3) That by knowing the exact chemical formula of the membrane, the solvent and the solute, one can absolutely predict whether or not osmosis is going to take place and in which direction it is going to take place even before the experiment is started. It was further proven that the theory that only crystalline substances are dialyzable was entirely at fault, because colloids will pass through certain membranes through which crystalloids will not pass.

If chloroform is placed in the bottom of a beaker, over this a layer of water is carefully placed and over this a layer of ether, as in Fig. 1, and the beaker is set aside, in a rela-

tively short time there will be only two layers in the beaker, a lower layer consisting of chloroform and ether saturated with water and an upper layer of water saturated with ether and chloroform. That the change is not due to gravity is evident because water is considerably heavier than ether, and chloroform heavier than either. Instead, it occurs because water has a slight affinity for ether and chloroform has a greater affinity for ether than has water. In other words, the water takes up a little ether and as it takes up the ether, the chloroform in turn robs the water of the ether until practically all of the ether has been taken up by the chloroform. If, in place of ether, olive oil is substituted, as in Fig. 3, no change will occur if the beaker is allowed to stand quiet, because the water has no affinity for the olive oil. If, however, olive oil is dissolved in ether, as in Fig. 4, the water will abstract the ether from the olive oil and in turn the chloroform will rob the water of the ether, and there will in a short time be a rearrangement of the liquids, an upper layer of olive oil, a middle layer of water and a lower layer of chloroform and ether, as in Fig. 5. This occurs for the same reason as the changes in Figs. 1 and 2.

If an apparatus is arranged, as in Fig. 6, placing mercury in the bottom, then chloroform saturated with water, then a tight-fitting cork and then a layer of ether, no change will take place even if allowed to stand indefinitely. However, if the cork is first thoroughly boiled so as to drive out all the air and replace this air with water, a marked change immediately takes place. The ether gradually disappears and the mercury is gradually driven up in the tube until the pressure becomes so great that either the cork is displaced or the tube breaks from the increased pressure from within. The affinity of the chloroform for the ether is so great that it will rob the water in the cork of the ether with such avidity as to create pronounced osmotic pressure.

If a simple osmometer is made with a thistle tube with a flare of about 45 degrees at the mouth, the mouth carefully

to Prof. Kahlenberg for qualitative and quantitative analysis. In every instance in which a saturated solution of boric acid was applied appreciable quantities of boric acid appeared in the first specimen of urine voided and continued to appear in every specimen so long as the wet dressing was continued and for a varying number of hours after the dressing was removed. A considerable number of patients were followed up in this way. The quantity of boric acid excreted and found in the first specimens voided varied from 0.001 per cent. to 0.01 per cent. With one patient the highest amount voided at any time was 0.05 per cent., while with another the highest amount of boric acid found was 0.2 per cent. The variations in all the cases were between these two figures.

When we were thoroughly convinced that a saturated solution of boric acid was absorbed in considerable quantities when applied as a wet dressing we made tests with a 2 per cent. aqueous solution of boric acid as a wet dressing. In one of these cases not a trace of boric acid was found in the urine until the dressing had been in place forty-six hours, and then only 0.001 per cent. In a number of other cases treated with a 2 per cent. solution of boric acid no boric acid was found in the urine at any time.

These chemical investigations demonstrate why it is necessary to employ boric acid in saturated solutions and find their counterpart in the experiments with silver nitrate in pyridine when the septum was rubber. It will be remembered that in a 0.05 per cent. normal solution the silver nitrate in pyridine did not pass through the rubber for a period of six days, while in a normal solution of silver nitrate in the same experiment the osmotic pressure rose to 15.6 cm. by the end of the third day. It is evident that solutions must be of a certain minimum concentration before absorption or osmosis take place, and that the rapidity of absorption or osmosis bears a direct relation to the concentration of the solution. The affinity between the water and small amount of boric acid is evidently so great that the

minimum concentration in order that osmosis take place. In other words, even in laboratory experiments, if solutions are too dilute osmosis will not occur. Physical conditions, particularly stirring of the solvent, increase greatly the rapidity of osmosis as well as the osmotic pressure. The above experiments are a few selected from several hundred made by Prof. Kahlenberg and his assistants because I believe they illustrate best the nature of osmosis and because they explain what takes place when solutions are applied to external surfaces of the body.

Clinically, the laboratory experiments in osmosis can be very closely duplicated if we apply some substance in solution to the skin. The skin then becomes the osmotic membrane, the circulating blood and lymph beneath, the solvent, and the wet dressing or solution applied to the skin, the solute; the osmotic phenomenon will then occur, provided the skin has affinity for the solute and the lymph and blood have greater affinity for the solute than has the skin.

The two chemical substances used in our clinical experiments were boric acid and lithium carbonate. If one of these substances is dissolved in water in proper strength and an extremity is immersed in this solution or if the solution is applied as a wet dressing, it is rapidly absorbed. This is proved by the fact that within an hour the patient will void it in the urine. As lithium carbonate does not seem to have any marked therapeutic action if applied in this way, I will confine my remarks to our experiments with boric acid solutions. The experiments were conducted in the following manner.

The patient was directed to void his urine, then a saturated solution of boric acid was applied as a wet dressing. At the end of an hour, and after this at intervals of two hours, continuing during the period of illness and for two days after the wet dressings were removed, the urine was collected in absolutely clean sterile bottles, one bottle being used for each time the urine was voided. These samples were sent

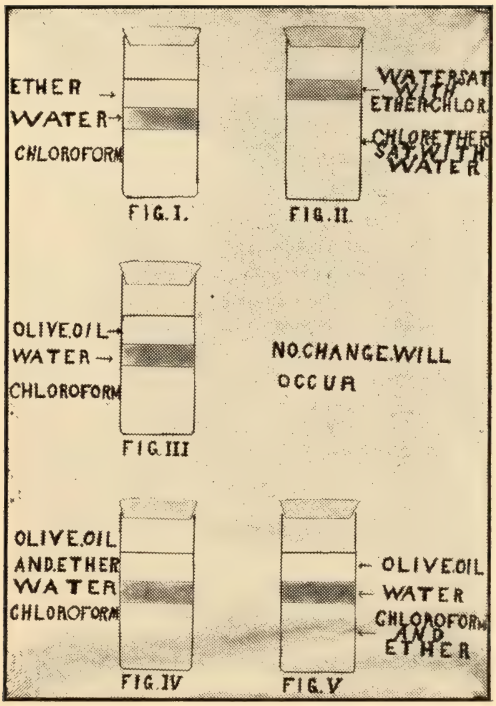
covered with dental rubber, such as used by dentists in making their rubber dam, water put on the inside of the thistle tube and the osmometer immersed in 99.5 per cent. alcohol, as in Fig. 8, the liquid will soon rise in the osmometer, showing that the alcohol is passing through the rubber dam into the water.

I think most of us have had the impression that rubber is an impermeable membrane, but as a matter of fact it is permeable to many substances. Osmosis takes place here because the rubber has a slight affinity for the alcohol, takes some of it up, but as the water has a stronger affinity for the alcohol than rubber has the water will rob the rubber of its alcohol and draw the alcohol through the rubber into the water. Osmosis through rubber will always take place if the rubber has an affinity for the solute, providing the solvent has a stronger affinity for the solute than has the rubber.

If a solid block of camphor weighing 2 grams is placed in the osmometer, as in Fig. 7, the outer liquid is CS_2 and the membrane is rubber, in four minutes it is clearly apparent that the block of camphor is being attacked. After thirteen minutes a thin layer of liquid is visible on the upper side of the rubber, and after forty-five minutes all solid camphor will have disappeared, having passed through the rubber into the CS_2.

If the inner liquid in Fig. 8 is a 0.05 normal solution of $AgNO_3$ in pyridine, the outer pyridine and the septum rubber, no change whatever takes place even if the experiment be continued for a period of six days. However, if the inner liquid is a normal solution of $AgNO_3$ in pyridine, the outer liquid pyridine and the membrane rubber, the liquid in the osmometer rises to a height of 15.6 cm. by the end of the third day.

I quote the above two experiments because they have an important bearing on clinical observations and because they are two of a considerable number of similar experiments which demonstrate that solutions must be of a certain


ETHER
WATER
CHLOROFORM
FIG. I.
WATER SAT WITH ETHER CHLOR.
CHLOROETHER SAT WITH WATER
FIG. II.
OLIVE OIL
WATER
CHLOROFORM
FIG. III
NO CHANGE WILL OCCUR
OLIVE OIL AND ETHER
WATER
CHLOROFORM
FIG. IV
OLIVE OIL
WATER
CHLOROFORM AND ETHER
FIG. V

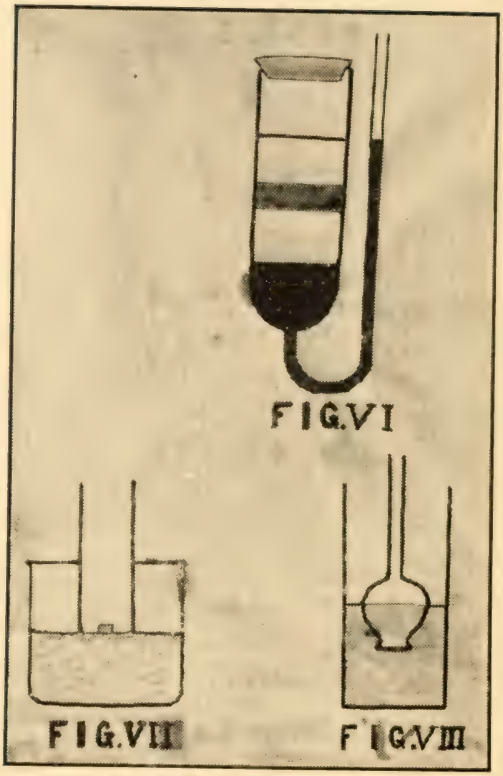


FIG.VI

FIG.VII

FIG.VIII

lymph and blood on the other side of the septum, the skin, is not strong enough to rob the water of its boric acid in the 2 per cent. solution, while the 4 per cent. solution evidently gives up its boric acid much more readily.

That boric acid when applied as a wet dressing in saturated aqueous solution is absorbed by the tissue I believe is incontrovertibly established by these experiments, but the skeptical might say, What of it? The fact that a certain substance is absorbed is not proof that it is of therapeutic value. However, I believe the next group of experiments, as well as our clinical experience, will prove that boric acid if absorbed is of value in septic infections. Boric acid does not seem to have any power of inhibiting the growth of pathogenic bacteria but I am fully convinced that it has great power in reducing their virulence. I have repeatedly withdrawn streptococcus pus from a patient suffering from a septic infection of one of his extremities, and injected varying amounts of this pus in the peritoneal cavity of guinea-pigs and mice. If this pus were withdrawn and injected before the patient had been treated with boric acid as a wet dressing, one to five minims of this pus invariably killed the test animal, while if the patient had been treated with the wet dressing for a number of days I have repeatedly injected 60 minims of this same streptococcus pus without causing the death of the test animal or even making the animal sick.

When we consider that under ordinary circumstances, passing streptococci and other pathogenic bacteria through the human body practically always greatly increases their virulence, the actual reduction of virulence in these cases proves, I believe, that boric acid as a wet dressing is a very potent remedy in the treatment of septic infection; in fact, I have come to the point where I look upon this dressing as almost specific in streptococcus, Staphylococcus albus and citreous infections of the skin and cellular tissue as well as in pemphigus.

In this connection permit me to state that my clinical experience leads me to believe that boric acid wet dressings are not nearly as effective in Staphylococcus aureus and entirely without value in gonorrhea, specific inguinal adenitis, chancre, chancroid, in infections caused by the Flaschen bacillus of Unna, in pyocyaneous infections, and in saprophytic infections; and even harmful in malignant edema, in tuberculosis, and in impetigo contagiosa. In order not to be disappointed in our use of boric acid wet dressings, it is important that we make a diagnosis as to the nature of the infection. As a rule this can be done easily, at least one can practically always say whether a case is one of tuberculosis or impetigo contagiosa and it is only in these three infections that boric acid is contra-indicated.

In order that the maximum amount of good be derived from this dressing, in cases of cellulitis and other forms of septic infections, a number of other points in its use should be observed. Probably the most important therapeutic agent and the one most often neglected is "rest." Rest in bed with the extremity elevated and with the muscles surrounding the joint at equilibrium should always be insisted upon.

The eliminative function of the bowels, lungs, skin, and particularly the kidneys, should be carefully looked after.

Septic infections of all kinds are attended with more or less pain which in some cases may not only be excruciating but very persistent. We must not forget that long-continued severe pain greatly interferes with a patient's ability to develop immunity. Those of us who were not fully impressed with the above fact have had ample opportunity to become impressed with it by a careful study of the opsonic index in a large number of cases. In every case thus studied it was found that the opsonic index absolutely refused to rise until the pain had been relieved in some other way than by the use of opiates. While boric acid dressings will relieve pain to a considerable extent, there are a number of other

remedies and devices which can be employed to bring about cessation of pain more rapidly. Ninety-five per cent. alcohol added to the saturated solution of boric acid in quantities of from 15 to 30 per cent. will often be found of great value. It is a good antiseptic, and in addition it has a strong dehydrating effect and will help to make the limbs warm and comfortable, relieving the extremity of the cold, clammy feeling of which the patient sometimes complains when aqueous boric acid solution is used alone.

Placing the patient in bed with the affected limb elevated also relieves pain. In addition the rest will keep the muscles quiet, preventing the septic material from being pumped into the circulation and reduces to the minimum the danger from acute endocarditis and pyemia.

When the infection is superficial the best analgesic is to paint the reddened and inflamed area with 95 per cent. carbolic acid until the skin turns white and then wash off the carbolic with alcohol. This will not only relieve the pain but will destroy innumerable bacteria, and will accomplish both without danger to the kidneys.

The question of drainage has been a perplexing one to many men, and has been the subject of much controversy. In the great majority of cases the veins and lymphatics can be drained by simply elevating the effected extremity, and this can be done so effectually that incision rarely becomes necessary. This drainage by elevation is assisted by the dehydrating power of the alcohol in the solution above advised.

There is an old rule in surgery, so old that I have not been able to trace its origin, which says: "Ubi pus, ibi evacuo"—or in English, "Where there is pus, there evacuate." This rule, with certain modifications, is still a good one, but in recent times it has too often been exceeded. Many surgeons seem to have construed it to read, "Before there is pus, evacuate," which, of course, is an absurdity. To many of you the above statement may seem like an exaggeration,

but in reality it is not. Sometimes these too early incisions are due to excessive zeal, and again they are prompted by fear of criticism on the part of one's fellow practitioners. I have no doubt but that everyone of you can recall one or more cases when such early incision was actually practised.

One should always secure drainage just as soon as an infection occurs, but until macroscopic pus develops, this can be done much more safely and effectually without incision. If pus has formed before the patient applies for treatment, or as will sometimes, though rarely, happen in spite of treatment, and a localized abscess develops, as manifested by fluctuation, the proper thing to do is to secure free drainage by incision, and the old rule finds its proper application. There are, however, several points about the incision that are of utmost importance: First of all before the part is incised, it is always well, whenever possible, to apply an Esmarch constrictor proximally to the proper point of the incision, and after the incision is made pack the wound with a strip of gauze which has been soaked in tincture of iodin. The Esmarch will block the veins and lymphatics until the tincture of iodin can secure the closure of the cut ends by favoring the formation of thrombi, when the Esmarch can safely be removed. When these precautions are not observed it often happens that the incision and necessary manipulation forces virulent septic material into the general system, as manifested by severe chills, marked pyrexia, and delirium a few hours after the operation. The part should be manipulated as little as possible in order to avoid these undesirable consequences, and especially is this last precaution to be observed if the incision is in some part of the body in which an Esmarch cannot be applied. Another important precaution in reference to the incision is, that the incision should always be within the line of demarcation or distal to it. An ordinary boil is always surrounded on all sides, except the skin covering it, by a wall of leukocytes. It can practically

always be incised without going through this line of defense. An infected finger is eliminated from the rest of the body by an infiltration of the tissues with innumerable leukocytes standing guard and ready to destroy any bacteria that come their way. The ridge can always be seen or felt, and it is just as easy to make the incision distal to this wall as to break down this barrier. I could cite many cases where this little rule was not observed, and almost always the convalescence was unnecessarily prolonged. One case in particular do I remember in which extensive incisions were made without an Esmarch and no attention was paid to the line of demarcation. The patient developed a chill within a few hours, the temperature rose to 106° F., and he died within two days from septicemia. Even if the patient is not thus overwhelmed with the septic poison the wrongly executed incisions always infect new areas which take much time and vitality to heal, and sometimes the convalescence is thus unnecessarily prolonged for weeks and even months.

An additional and very important reason why septic infections should not be incised until there is positive evidence of pus is that it takes some time for the patient to develop immunity, and unless a certain degree of immunity is established at the time of incision it is almost sure to spread the infection. This fact is one of the most important ones to be kept in mind in the treatment of infections, no matter where they may be located in the body, and hence this precaution cannot be too strongly emphasized.

If space permitted I could give the histories of a number of cases illustrating this point. Those cases in whom the incision was made too early always recovered much more slowly than did those cases who had developed this immunity before the incisions were made.

Incision when found necessary should be made under strictly aseptic precautions, in order to avoid mixed infection. At the onset the infection is invariably caused by one variety of pathogenic bacteria against which the patient has already

developed a certain degree of immunity at the time when the incision should be made. If now a new infection is superimposed upon the old one, an additional quite unnecessary burden is placed upon the already devitalized system which will certainly greatly retard recovery and may even jeopardize the life of the patient.

At the time of incision it is also advisable to make a culture of the uncontaminated pus in order that a vaccine can be prepared in case, for any reason, healing is retarded. These autogenous vaccines are found to be much more effective than are stock vaccines.

For a long time it was the practice of many surgeons to excise all accessible, enlarged lymph glands. I consider that this is a grave error. When a lymph gland has broken down, is suppurating, drainage is, of course, necessary, but so long as it is simply inflamed, it shows that it is doing its duty, and it would be just as wise to withdraw an active fighting garrison from the last fort, as it would be to excise an active lymph gland, even though it be inflamed. So long as it is not suppurating, it is waging a winning battle and demands our support. It is sometimes the only barrier left, and its removal may lead to general sepsis.

By following the method of treatment above outlined, I have usually been able to avoid incising septic infections and in cases which came to me before incision had been practised, I have never lost a patient, never found it necessary to amputate an extremity, not even a finger or toe, and have not one single claw-hand to my discredit.

I believe our physiochemical experiments, our biochemical studies, our bacteriological investigation and our clinical experience are corroborative and justify the following conclusions, viz., that osmosis is a purely chemical process; that boric acid when applied to the surface of the body in a saturated aqueous solution, is absorbed in appreciable quantities by a process of osmosis similar to the process studied in the chemical laboratory; that, when used in cases

of septic infection, it is most potent in reducing the virulence of certain pathogenic bacteria, but, that in order to be effective, it must be applied in saturated solution, and finally, that when applied as above directed in the early stages of septic infection most cases will make complete recovery without incisions, without the loss of any member and without impairment of function.

DISCUSSION

Dr. William Perrin Nicolson, Atlanta, Georgia.—The question that Dr. Ochsner brings up is of great interest. Twenty-five years ago I read a paper before this Association upon the subject of wet dressings in hand injuries in which, during the early days of antisepsis, I used listerine, which is largely composed of boric acid solution. I claimed then, and have demonstrated since, time and again, that when a man's hand is torn and lacerated, it is not necessary even to wash the hand of its grease, as I used to do in treating men with railroad injuries. By covering over the ragged space or spaces with gutta-percha tissue, and keeping the hand wet with listerine, you can organize a blood clot in 100 per cent. of cases by keeping the hand wet, not with a moist dressing, but the patient carrying around with him a bottle in his pocket. I cover the outside with gutta-percha tissue, and whenever that begins to dry out the solution is poured freely on so that it goes into the interstices of the wound every time, I do not care how ragged it is. If you do not cut anything off that is hanging, you can save the hand and get a perfectly useful member. Many hands have been cut off that could have been saved by this method. The main thing is not to cut off anything that is not hanging by a shred. Dr. Ochsner has explained the action of the boric acid in doing this.

I have tried in these dressings other preparations that contained formaldehyde, but with formaldehyde you cause a gray blood clot, whereas if you dress the hand with this for four days you have a bright, crimson red blood clot and a hand restored to usefulness. Hands that look as though they were absolutely hopeless have been saved by this means by those who treat hands in this way. I have written a good deal about this sub-

ject, but it is one over which I feel enthusiastic because it is practically possible to organize a blood clot in 100 per cent. of cases by keeping the dressings moist with a solution of boric acid. A plain solution of boracic acid will do as well as the other. Where sloughs take place under it, the listerine protects the patient from the disagreeable odor of the sloughs coming away, and the hand takes care of itself if the surgeon lets it alone.

Dr. Hubert A. Royster, Raleigh, North Carolina.—I am absolutely satisfied that the essayist is right in one particular, namely, we have been too indefinite and too indiscriminate in our use of topical applications. We have put certain solutions on every kind of wound that came under our care, and when we achieved good results we attributed them to the solution. One is reminded in this instance of Montaigne's stricture upon the medical profession when he said that after the use of a remedy, one cannot say whether it was due to the remedy applied, to the lapse of time, or to one's grandmother's prayers. We have to be sure in each case we have done the right thing for the particular kind of wound.

I was interested in a paper the other day in regard to the use of acid solutions in the pyocyaneus infections. On taking the reaction of the pus in each infected wound in all instances I found with the staphylococcus infection I was using an alkaline dressing on an alkaline wound, and the organisms thrived beautifully; so that I changed the dressing, using acid applications, and the wound immediately began to improve. That may have been another case of *post hoc*. In alkaline wounds, I use this solution, which was suggested to me by a surgeon recently: vinegar, one quart; bleaching powder, one ounce; magnesium sulphate, three ounces. I understand it has been used in New York for many years and is really equal to, if not better than, the so-called Dakin solution. Irrigating wounds with the solution and applying it in the form of a drip always gives excellent results in alkaline infections.

Dr. William B. Coley, New York City.—It is very promising to see as much interest taken in the antiseptic treatment of infected wounds, as brought out by this war, and I think the paper this morning is very valuable in showing what can be accomplished by the proper use of such a simple thing as boracic acid. I think we ought to become more specially interested in what has been done with Dakin's fluid abroad. In spite of the wonderful results achieved by Carrel and Dakin by the use of

this fluid, by its proper application, it seems a rather hard thing to learn. It is very hard to get American surgeons to adopt it, as well as some French and English surgeons. The American ambulance gave it up after the first trial, but are now taking it up again. One of the members of our staff from the New York Hospital for Ruptured and Crippled, who has just returned from Paris, saw it used freely in Paris hospitals, particularly in major cases of compound and comminuted fractures, which, he said, were practically all rendered entirely sterile in ten days with the proper use of Dakin's solution without regard to the type of organisms and infection. Hundreds and thousands of limbs have been saved by this solution that formerly would have been amputated. We ought to learn to use Dakin solution, and we can only learn how to use it and we should use it in railroad surgery and infected wounds. I have been using it in a number of cases the last year, and in every one suppuration and infection have been promptly controlled.

Dr. Robert C. Bryan, Richmond, Virginia.—I should like to confirm what Dr. Coley has just said. I happened to have been in a hospital for four months which is located thirty miles north of Paris. I had an opportunity to go to Compeigne and meet Dr. Carrel and have a talk with him and see his work. He uses at this hospital exclusively the Dakin or Carrel solution. It is made of .45 of 1 per cent. of the hyperchlorite of soda solution; stronger than this it is destructive to the tissues. I saw in his hospital the most mutilating injuries that any of us see in civil practice, or are likely to see. These injuries consisted of horrible compound fractures, the tearing away of whole extremities, enormous surfaces which had been saturated with the soil, which meant all kinds of infection from germs.

These wounded soldiers were brought to the hospital within a few hours after the injury, they are cleaned up, the ragged and necrotic tissues, as well as pieces of bone devoid of periosteal attachments are removed, and rubber tubes are placed upon the wound which are perforated with many holes; around the end of the tube is an envelope of turkish toweling which constantly saturates the wound with its thousand little arms. I have seen as many as 25 tubes used in one case. Daily microscopic examinations are made. Four hours before a microscopic examination is to be made the solution is turned off. I do not mean by turning it off that the Carrel solution has bathed the parts; it does not; it is simply kept in constant contact with the

surface. There is no soiling of the tissues or the linen or bed, or excess fluid. A platinum needle goes down to the depths of the wound, a smear is made, fixed and examined immediately. No significance is attached to the character of the germ, whether it is the gas bacillus or streptococcus. It is not the character of the germ but the number. When there is only one germ to four fields the wound is then considered ready to be sewed up. If two germs, it is not sewed up, and the solution is continued. When only one germ is found it is sewed up, the resulting cicatrix is clean, nice, soft, pliable. I have seen a soldier with compound fracture of the thigh walking in forty-two days.

Dr. Carrel has color photographs and moving pictures of the progressive stages of the cicatrization and the getting well of patients from these different wounds. It is really marvelous to see what has been done, and what is being done, it is so wonderful that I hesitate to give any specific illustration.

Dr. Ochsner (closing).—In answer to the question of Dr. Elbrecht regarding glycerine, I would say that I have used from 15 to 33 per cent. of 95 per cent. alcohol with the saturated aqueous solution of boric acid for exactly the same purpose that you mention. The details of its use will appear in the published paper.

The plea which I would make particularly is this, that we should adjust our treatment to the microörganism involved. In streptococcus infections of all kinds, in staphylococcus citreus and albus, we should use a saturated solution of boric acid and water, with or without the alcohol, as the case may require. When this is properly applied we have as near a specific for these infections as quinine is in malaria.

I will venture to guess that in this country Dakin's solution is not going to prove as satisfactory as it seems to have done in France because the nature of the infections is very different. Their very virulent infections probably succumb before they reach the base hospital and the less virulent microörganisms, particularly the saprophytic microörganisms, are the ones which have to be overcome and for these nascent hypochlorite is unquestionably very effective. In septic infections proper, my experience is that it is of little value and the solution which I have recommended is much more potent.

I believe that the next two or three years will prove the correctness of this statement.

ENTEROSTOMY: A PERFECTED TECHNIC ILLUSTRATED

By John Wesley Long, M.D.
Greensboro, North Carolina

Enterostomy should never be done as a matter of choice. It is not an operation of election if it be possible to successfully use any other method. On the other hand, it is a life-saving measure, and has rescued many a patient from an untimely grave.

The writer would not advocate a wider application of enterostomy, rather does he believe in a very restricted use of this invaluable operation. Every surgeon must, as a matter of course, be his own judge as to the indications for doing enterostomy, but it is surprising, even to those who have given the subject careful thought, what varying conditions may be relieved by the procedure. Many cases of intestinal obstruction are entirely cured by simply an enterostomy.

The indications may be roughly grouped as follows: (1) to relieve temporarily patients suffering with intestinal obstruction, as from carcinoma of the colon; (2) to safeguard an operation done at the same sitting, as resection of the bowel; (3) to overcome the evil results of a previous operation, for instance, obstruction following abdominal section; (4) to establish an opening through which to feed a patient, as a jejunostomy done for inoperable conditions of the stomach.

An operation capable of such a high degree of efficiency and for so many conditions deserves to be standardized. That it is an approved operation is evidenced by the testimony of many surgeons, but so far no one has formulated a generally accepted technic for doing it.

For the purpose of illustrating the technic herein offered we may describe a case of intestinal obstruction following abdominal section. By the second, third, or fourth day the bowels have not been moved, nor has flatus passed. There are increasing tympany, muscular rigidity, and abdominal tenderness. Acute dilatation of the stomach develops, with excessive thirst and frequent vomiting of stomach and duodenal contents. The stomach tube gives only temporary relief. The patient is restless, anxious, and evidently losing ground. Auscultation of the abdomen reveals intestinal metallic gurgling sounds, due to paroxysmal waves of peristalsis occurring at frequent intervals. The peristalsis forces the liquid and gaseous contents of the bowel to the point of obstruction and produces much pain. Urinalysis shows albumin, casts, and indican in increasing quantities.

No wise surgeon gives purgatives under such circumstances. Enemas of every kind have been tried and failed. The patient's condition is getting desperate, something must be done, and that quickly. Often by this time not only the patient but the family have become demoralized. The thought of another operation only adds to the confusion. It is in cases of this kind that enterostomy offers the greatest relief.

If circumstances will permit the patient should be gently removed to the operating room, where any measure can more conveniently be carried out. However, an enterostomy can be done without removing the patient from the bed. With the judicious use of a local anesthetic and the persuasive words of the tactful surgeon the entire operation may be conducted without producing either pain or fright.

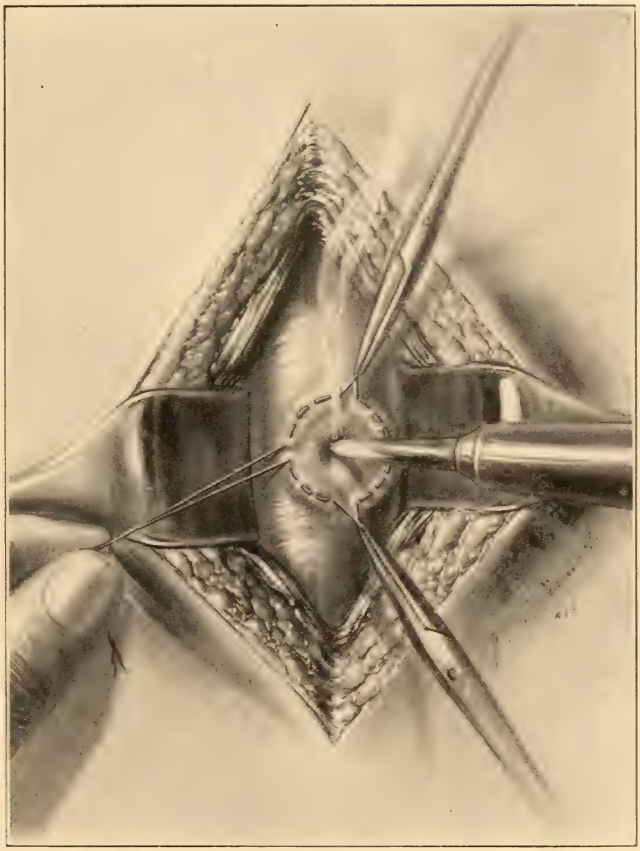


FIG. 1.—Enterostomy. Purse-string suture introduced; cautery burning an opening into bowel.

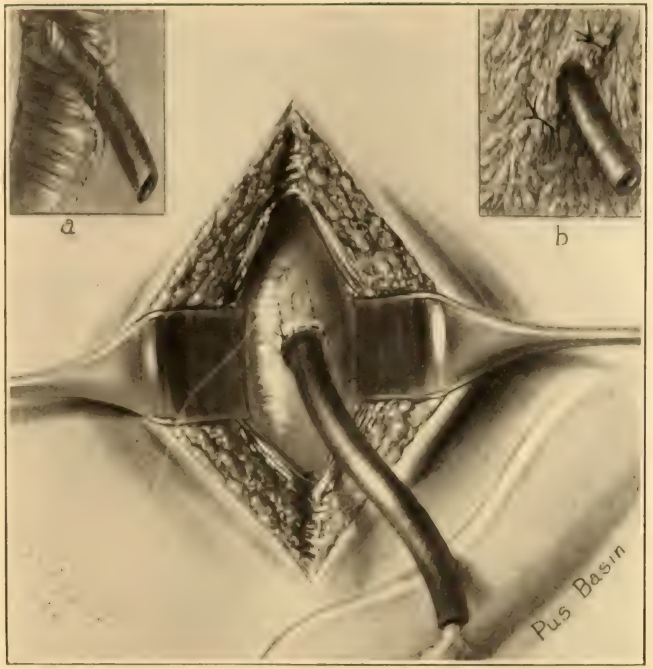


Fig. 2.—Enterostomy. Drainage tube in the intestine; purse-string suture tied. Inset *a* shows tube in bowel and two purse-string sutures applied. Inset *b* shows omentum which has been perforated and the tube drawn through it; two superficial catgut sutures hold the omentum snugly about the tube and intestinal fistula.

Fig. 3.—Enterostomy. Operation finished, rubber tube *in situ* and held in place by two narrow adhesive strips, the upper and lower end of the incision sutured. The portion of the wound about the tube is filled with fluffy gauze which prevents protrusion of the intestines and promotes adhesions.

Under the plea of "dressing the wound" a few stitches are removed and the edges of the incision gently separated. When the peritoneum is opened one should not search for the point of obstruction unless it be easily reached, but content himself by dealing with the first distended coil of intestine that presents itself. The emphasis is upon distended, since it is worse than useless to puncture the bowel below the obstruction. When the obstruction is purely mechanical and no sepsis is present more freedom is allowable. Without disturbing the parts unduly a purse-string suture, preferably of chromic gut, is placed in the bowel wall. The needle should be introduced rather deeply. An area a good half-inch in diameter is included (Fig. 1). By catching the suture at two equidistant points with forceps and the untied ends between the fingers, sufficient tension can be maintained to serve the double purpose of steadying the parts and reduce the soiling of the field to a minimum.

While the suture is being held, as indicated in the drawing, the pencil-point of a thermocautery is made to slowly burn a hole into the intestine. The cautery is preferable to the knife or scissors for several good reasons: (1) a burnt wound does not bleed, a stab wound into the intestine occasionally severs a small vessel, which requires ligating; (2) a perforation made by burning tends to contract rather than to get larger, which is an important consideration when dealing with an intestinal fistula; (3) the heat seals the various coats of the intestine together so that the edges do not separate or retract; (4) there is a notable absence of eversion of the mucosa, which is seen in stab and pistol-shot wounds of the intestines.

Before the perforation is made the enterostomy tube should be prepared and near at hand, so that as the cautery point is withdrawn the tube can be immediately introduced and thus avoid the escape of intestinal contents. The tube

is preferably one of fairly soft rubber that will not collapse. It should be smooth and without enlargement of any kind. A tube twice the size of the opening can be easily introduced, since the bowel wall is elastic. The disproportion between the size of the tube and the fistula causes the rim to hug the tube closely, which prevents leaking.

The forceps are now removed from the suture and the ends tied. With a little care the inversion of the edge of the perforation is easily effected (Fig. 2). If the condition of the intestinal wall will permit a second purse-string suture adds to the security and increases the inversion, which favors the subsequent healing of the fistula by bringing a wider margin of serosa to serosa (insert *a*).

Whenever it is possible to do so the omentum should be drawn about the tube, and, if need be, stitched in place by one or two fine plain catgut sutures. A splendid plan is to puncture the omentum and pass the distal end of the tube through it (insert *b*). Utilization of the omentum with which to safeguard the intestinal opening, both before and after the tube has been withdrawn, cannot be too strongly emphasized.

Formerly the writer stitched the tubing to the intestine in order to secure it in place; but this is a mistake, since the suture from tube to gut is liable to cut out and increase the size of the opening. Besides, on subsequently removing the tube the anchor suture disturbs the inversion, which greatly interferes with healing. The tube is best secured by narrow strips of adhesive plaster to the skin (Fig. 3).

Unless the abdominal cavity be already shut off from the field of operation by adhesions the open portion of the wound should be filled with fluffy gauze, which will protect the peritoneum and promote the formation of adhesions.

When the perforation has been done with the cautery, the edge properly inverted, and the parts surrounded by

omentum the fistula usually heals of itself very promptly. The writer has had fistulæ that did not leak a drop either before or following the removal of the tube. While there is no operation more serviceable than an enterostomy, when indicated there can be nothing more annoying than a fecal fistula that will not heal. The technic herein presented reaps the benefits of the one and avoids in a large percentage of cases the evil effects of the other.

This method of doing enterostomy can be safely accepted as the standard. Also, it may be said that, like the singing of the Southern mocking-bird, one of its chief beauties is the variations to which its technic is susceptible, and that too without departing from the principles involved in its standardization.

For instance, the use of the appendix through which to insert a catheter for drainage is only a refined method of doing enterostomy. Under certain circumstances it is not necessary to use a purse-string or indeed a suture of any kind. Occasionally, after the distended bowel is emptied, its walls are so flaccid as to allow of an inch or two of the drainage tube being covered by suturing the bowel over it similar to a Witzel gastrostomy. This, however, is not often advisable, especially if the omentum can be made to surround the fistula. In some cases the omentum cannot be utilized. Securing the fistulous area to the parietal peritoneum by a continuous suture after the manner of Kocher is not advisable unless a permanent fistula is desired. If it is thought expedient the bowel may be anchored to the peritoneum with two to four interrupted sutures. Should it not be practical to open the abdomen through the former incision it is easy enough to make an independent incision under local anesthesia. Other variations might be mentioned, but suffice it to say that a standardized technic once understood and approved can be easily adapted to meet the conditions found.

DISCUSSION

Dr. E. Denegre Martin, New Orleans, Louisiana.—With reference to the operation described by Dr. Long, Dr. Parham and I on a former occasion reported 20 cases in which we resorted to a similar operation, and probably have had 10 more cases since then. Some of these patients were moribund when we were called to see them. In cases in which it was used immediately, the patients improved rapidly after operation. Especially in cases in which distention was marked and peritonitis beginning. If the catheter is dropped in at that time it is perfectly marvelous to see the relief these patients get. The Murphy drip is constantly kept up through the catheter. The technic we follow is very different and very simple. We simply expose the bowel as Dr. Long does, make an opening drop in a Pezzer catheter and run a suture around it. Sometimes we do not do that even; we close the abdominal wall around it. We have done most of these operations under cocain anesthesia and have been using it for a number of years. If there is any hemorrhage you can draw the Pezzer catheter up against the abdominal wall and it will control the bleeding. It is very effective and, I believe, is life-saving.

CONGENITAL LIPOMATA OF THE CHEEK

By Joseph Ransohoff, M.D., F.R.C.S. (Eng.)
Cincinnati, Ohio

Congenital tumors in the restricted use of the word are rare, and rarest of them all are the lipomata. In 1884, Jacobi [1] collected 29 cases of the latter from the literature extending over a century. Many of the cases were not clean lipomata, but associated with lymphectasis, causing a localized gigantism. There must also be excluded from the congenital lipomata those cases in which the lipoma is only an addendum to some congenital deformity like spina bifida, with which it is not infrequently associated, or with the various teratomata as they occur chiefly about the sacrum and coccyx. Morestin [2] in reporting a congenital lipoma of the calf quotes a thesis of Malacon, who was enabled to collect only 12 examples of congenital lipoma.

Of 73 cases of lipoma observed by Billroth [3] in Zurich and Vienna only one was congenital. It was on the dorsum of the foot. Lipomata of the cheek have been described by a number of authors, but very few have been seen sufficiently early in life to be indubitably congenital.

Perhaps the most interesting subject connected with fatty tumors of the cheek is the history of our knowledge of a little mass of fat, situated on and adherent to the outer surface of the buccinator muscle. It exists before birth and continues throughout life, and does not disappear even in extreme emaciation. Since from its function it may properly be called the sucking cushion or pad, it may be

considered an anatomical proof that man never ceases to be a sucker no matter what his age.

English and German anatomies refer but briefly to this fat pad. Like so many other things in medicine it was discovered and forgotten a number of times. It is probable that it was first recognized as a distinct entity by Heister [4] in 1732, who described its shape and relations very accurately, but believed it to be of a glandular nature, probably on account of its proximity to the molar muciparous glands. Fig. 1 is a reproduction of Heister's copper plate of the fat pad, and Fig. 2, likewise reproduced from the original engraving of Heister, shows the lobulated condition of the fat pad, which doubtless lead him to believe it to be of glandular origin. This figure is particularly interesting in that it apparently shows two lobules into which the fat mass is often divided by the passage of the terminal part of the parotid duct.

Thirty years after Heister, Winslow [5] fell into the same error, but stated that one might easily mistake the glands for little fat masses. It remained for Bichat [6] in his general anatomy of 1801 to finally recognize this pad as consisting of adipose tissue, which has ever since been recognized by French anatomists as la boule graisseuse de Bichat.

Probably Tillaux,[7] better than any regional anatomist, has depicted, in the clearest way (Fig. 3), this fat pad, which he described as follows. Between the buccinator muscle and its aponeurosis there is a constant fat ball even in the most emaciated subjects. It corresponds to the anterior border of the ascending ramus of the jaw, in relation with the anterior border, and a little on the inner surface of the masseter muscle, which it separates from the buccinator. The cheek presents therefore two layers of fat which are distinct from each other. The one superficial, subcutaneous above the fascia, the other deep seated

and beneath the fascia. The first layer is continuous, with the subcutaneous adipose tissue of the temporal and parotid regions. The second is continuous with the fat of the zygomatic fossa, and through it with the subaponeurotic layer of the temporal region and of the floor of the parotid niche. In many subjects this little ball of fat is loosely surrounded by a thin capsule, through which it can be, as Bichat first showed, lifted out of the pocket in which it is contained.

A very interesting study of this little fat mass was made by Ranke,[8] who discovered it already well formed in the fetus as early as the fourth month. He recognized its covering with the special capsule and described particularly a prolongation, likewise covered by a capsule, which is projected into the sprenopalatine fossa, and gives at times a pedunculated appearance to the little ball of fat. All writers agree that the suction pad is separate and distinct from the general subcutaneous adipose layer.

In 1853 Gewhe,[9] in a long-forgotten thesis, came to the conclusion that the function of this fat pad differs from that of fat in general and believed that in a mechanical way it aided the act of sucking, in that since the buccinator muscle in the newborn is still very feeble, the fat pad by its outer attachments prevents the indrawing of the cheek while nursing.

Fatty tumors of the cheek were, so far as I know, first mentioned by Bruns,[10] who collected 4 cases. He called attention to the ease with which the growth might be mistaken for a parotid tumor. Two cases of lipoma of the cheeek are contained in the statistics of Stoll,[11] one of which probably sprang from the fat pad under consideration. A case was reported by Villars [12] to the French Academy in 1888, and in his article he refers to 10 other lipomata of the face, the descriptions of which, however, are very brief, and it must be questioned whether they

belong to the deep-seated group springing from the fat pad of Bichat. None of these cases were distinctly congenital.

Virchow[13] in his classic work on tumors refers to a single example contained in his collection. Gant[14] and Mathias[15] have reported cases in the *Lancet*. They are the only cases which I have been enabled to find in the English literature. I am perhaps fortunate therefore in being enabled to present 2 cases, congenital in nature, that have been under my care, with an interval of over twenty years between them.

The first was a little girl, aged six months (Fig. 4), who from the time of her birth had a large swelling of the left cheek which grew rather rapidly. On examination there is a tumor as large at a small peach, involving the thickness of the left cheek. It extended from near the ear to the angle of the mouth. On bimanual examination from within an intrabuccal projection could be felt. The skin could easily be moved over it. The surface of the tumor was lobulated and there was a sense of fluctuation in it. The operation, done from without, revealed a lipoma which in places had undergone a myxomatous degeneration.

The second case (Fig. 5) was of a little girl, aged five years, who was operated upon in Russia, where at the age of one year a tumor was removed through an incision made near and parallel to the margin of the lower jaw. Examination revealed the presence of a uniform swelling of the left cheek, extending from the zyoma to the angle of the mouth. This was very much depressed. Between the dental arches the tumor mass projected as a roll, about the shape and size of an adult thumb. Skin and mucosa were easily moved over the swelling, which was of firm consistence and of even surface. An attempt to remove the growth through the old incision failed, so that an enucleation through the mouth was done. The tumor could not be removed in one mass, but was removed piecemeal. The

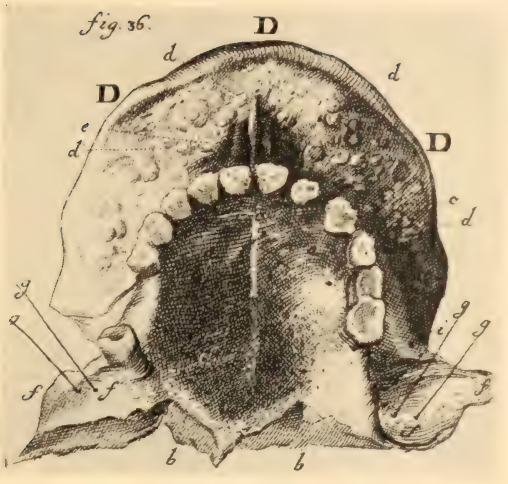


FIG. 1.—*g*, *g*, fat pad.

FIG. 2

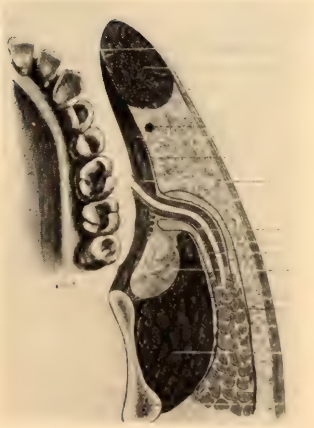


FIG. 3

Fig. 4

Fig. 5

pathologist reports that for a lipoma there was an unusual development of fibrous and lymphangiomatous tissue, much in excess of what is found around or within the capsule of the ordinary lipoma. This is interesting in view of an observation first made by Butlin [16] in connection with the report of a congenital lipoma removed from the calf of the leg. It is that the congenital lipoma nearly always presents a greater admixture of fibrous tissue than the acquired lipoma, and that very often, as was stated in the beginning of this article, they are associated with conditions of lymphangiectasis.

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THE TREATMENT OF CLEFT PALATE AND HARELIP IN EARLY INFANCY

By Vilray P. Blair, A.M., M.D.
St. Louis, Mo.

The question as to the age of election for operating upon congenital clefts of the palate and lip has narrowed down to a matter of months; practically all observers of large experience agreeing that it is desirable to have the lip cleft closed within the first six months and the palate within the first two years. After two years the available palate tissue may not increase in proportion to the width of the cleft, and also after this period closure of the cleft does not directly do away with the "cleft palate" enunciation, special training being required to attain a normal speech. The longer the operation is postponed the more pronounced is this defect apt to be. Some operators prefer the first twenty-four hours for the operation on the lip and alveolar part of the palate cleft; some prefer to operate between three weeks and three months; while others postpone the work until after three months. The writer's conclusions are as follows: Within the first twenty-four hours is the ideal time, (1) because at this age the infant seems almost immune to shock and stands the necessary hemorrhage remarkably well. We have never had a death from shock or hemorrhage in an infant under two weeks of age. (2) It is a great relief to the parents to have the first operation over and the child presentable in appearance (Fig. 1). (3) The earlier the operation is done the easier is the

forceful adjustment of misplaced bones accomplished (Fig. 10). (4) At birth, no matter how wide the cleft and how great the distortion, there is usually enough material to make a repair. When left unrepaired the distortions tend to increase and the tissues do not grow in proper proportion. A very poor repair of the lip will not prevent these distortions (Fig. 2), but when a fair adjustment is made it tends to become more perfect with growth (Figs. 3 and 20). (5) After an early repair there is more chance of preserving the mother's milk.

If the operation is postponed until after the feeding period of the infant's life is begun, then a local infection, jaundice, digestive disturbance or malnutrition may become factors in the selection of the time for operation (Fig. 4).

Up to three months the "Brophy" type of operation for the forcible closure of the alveolar part of the palate cleft is usually practical (Fig. 1). Some prefer to postpone the lip operation until after three months because the lip pieces are larger and easier handled. If the alveolar cleft has already been closed by a "Brophy" operation, or if the lip cleft was uncomplicated, the deferring of the lip operation until after the child is three months old is good practice; but after three months one had best not attempt forcefully to close an open alveolar cleft, either by fracture or sudden bending. The repair of the lip across the cleft will cause the latter gradually to close and will usually bring the bone parts in good relative position (Fig. 5), but is very apt to be accompanied by a collapsed or a depressed, ugly nostril on that side (Figs. 6 and 7).

After the upper cuspids and one molar on each side have fully erupted, the borders of the anterior part of the bone cleft can very quickly be approximated by means of an orthodontic appliance (Fig. 8).

Closure of the Alveolar Cleft. The "Brophy" plan, practicable usually up to three months, consists of

the forceful closure of the alveolar cleft, narrowing of the anterior part of the palate cleft, freshening the edges of the approximated bones and holding them in position by through and through wire sutures twisted over lead plates (Fig. 11). It is not desirable to free the maxillæ by cutting into them, and fracture of the alveolar process is to be avoided. For these reasons the operation is seldom advisable after three months. In doing this operation the writer now makes no attempt to close completely, or even materially to narrow, the posterior part of the cleft in the hard palate, since it is unnecessary, and a strenuous effort to do so is hazardous (Fig. 13). In this adjustment of the palate, whether it is for a single or double cleft, the premaxillary part should be placed well in front of and not to the mesial side of the maxillary portion of the alveolus. In a single cleft the maxillary bones are to be pushed toward each other and the protruding premaxilla brought to lie somewhat in front of the short maxillary process. No bone-cutting is required (Fig. 14). In the double, complete cleft (Fig. 15), where the premaxilla stands out on the end of the nasal septum, it is usually advisable to make an oblique, single, submucous cut, or a submucous removal of 5 mm. of the lower border of the septum, so as to allow the premaxilla to drop back into contact with the maxillæ (Fig. 16). However, this cut in the septum should not be made until it is determined that the anterior end of the maxillary processes can be sufficiently approximated to insure the premaxilla of resting in front of the maxillæ and not dropping back into the cleft (Fig. 17). If this cannot be done then it is probably better practice not to cut the nasal septum but, after pushing the premaxilla as far back as possible with thumb pressure, to free the cheeks and alæ of the nose from the maxillary bones by undercutting and to make the repair of the lip over the cleft.

A single wire alone passed through the maxillæ and

Fig. 1

Fig. 2

Fig. 1.—A single complete cleft of lip and palate operated at twenty-four hours, and the result eight days later.

Fig 2.—To the top is shown a child that had a poor lip repair in early infancy. Besides the lip notch, notice that the bridge of the nose is drawn to the opposite side. To the bottom is a boy with an unrepaired right-sided harelip; the lower edge of the nasal septum inclines to the left so that when the lip is repaired and the columella and the left ala are drawn toward the midline the left nostril will be even more obstructed.

Fig. 3.—Shows a child that had a Rose and Brophy operation at two weeks, for a single, complete cleft. The photograph to the right, taken at eight months, shows quite a shortening at the suture line. The central picture, taken at fifteen months, shows this shortening to have been spontaneously corrected. This has been observed a number of times.

FIG. 4.—A starved child which later died of inanition. Was breast fed and because the child was able to draw some milk this was thought to be sufficient. A baby sucks both by creating a partial vacuum and by biting the breast at the same time. A cleft palate baby can create no vacuum but can often draw some milk by compression When this is so it should be allowed to nurse for the regulation number of minutes each feeding but supplemented by a feeding from a bottle that has a large hole in the nipple; preferably with the mother's milk. The writer has encountered one infant, with a single, complete, palate cleft, which learned to nurse efficiently by placing the nipple under its tongue and closing the cleft with the dorsum of the same.

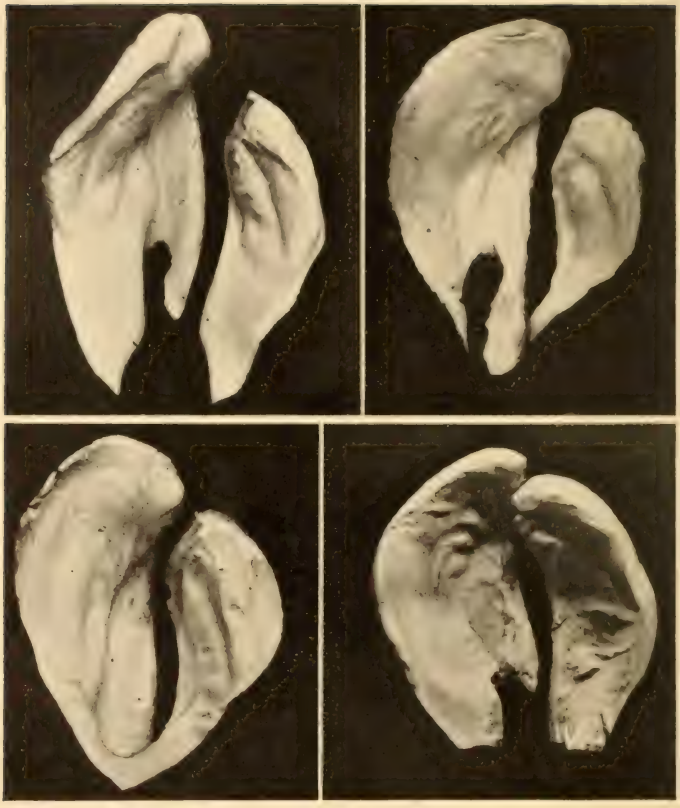

Fig. 5.—Shows the spontaneous closure of the alveolar part of the cleft that will usually occur when the lip is repaired. The upper right picture is of a cast made of a cleft palate in a child twenty weeks old. At this age it is not good practice to forcefully close the alveolar part of the cleft, but the lip was repaired. The other three casts were made at twenty-three, thirty and forty-four weeks, respectively, and show the gradual closure which occurred from the lip pressure without any damage to the developing teeth.

FIG. 6.—The alveolar part of the cleft is sometimes very slow in closing spontaneously after the lip is repaired and when the lip is repaired over an open alveolar cleft it is very apt to be accompanied by a flat, ugly nostril, as shown in the third photograph.

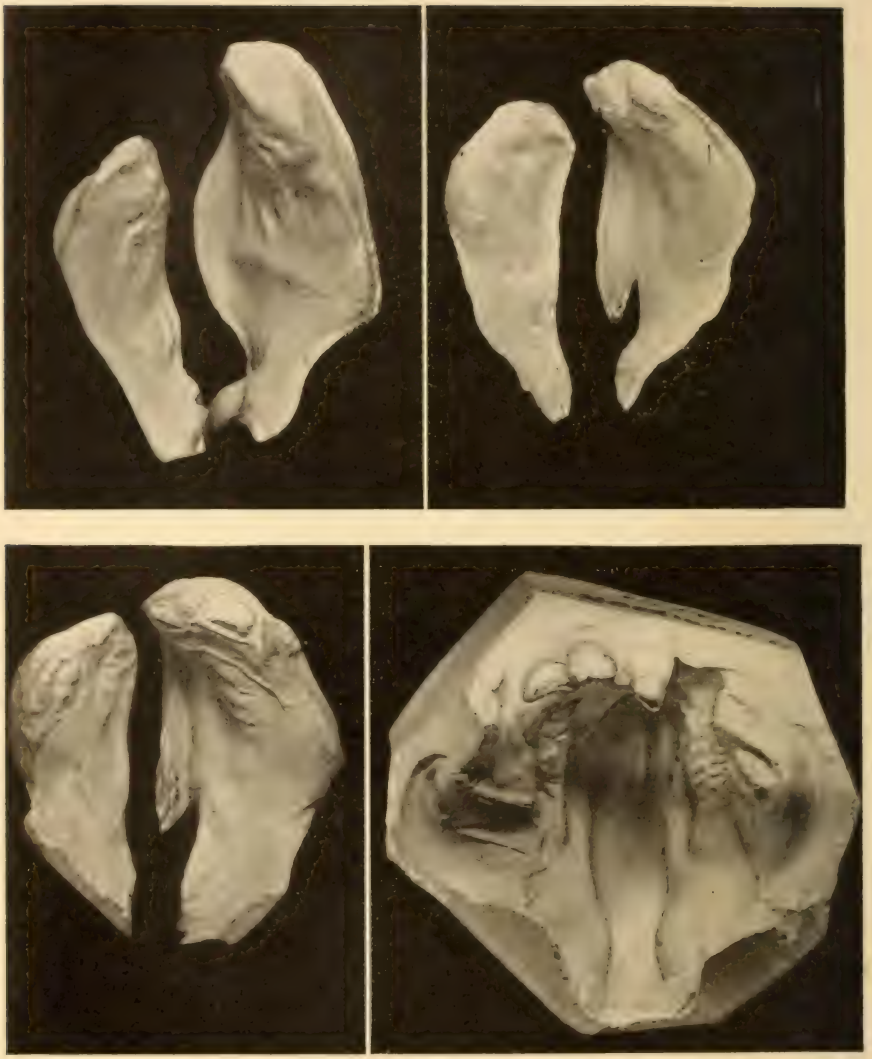

FIG. 7.—The upper two casts and the lower left one are of the palate of the child shown in Fig. 6. The ages at which the casts were made were six, ten and fifteen months respectively. The lip was repaired over the open alveolar cleft, because at six months the child was too old for a Brophy. The fourth cast is of a child whose lip had been repaired over an open alveolar cleft at two weeks of age, yet, twenty-three months later, it will be seen there was a wide alveolar cleft.

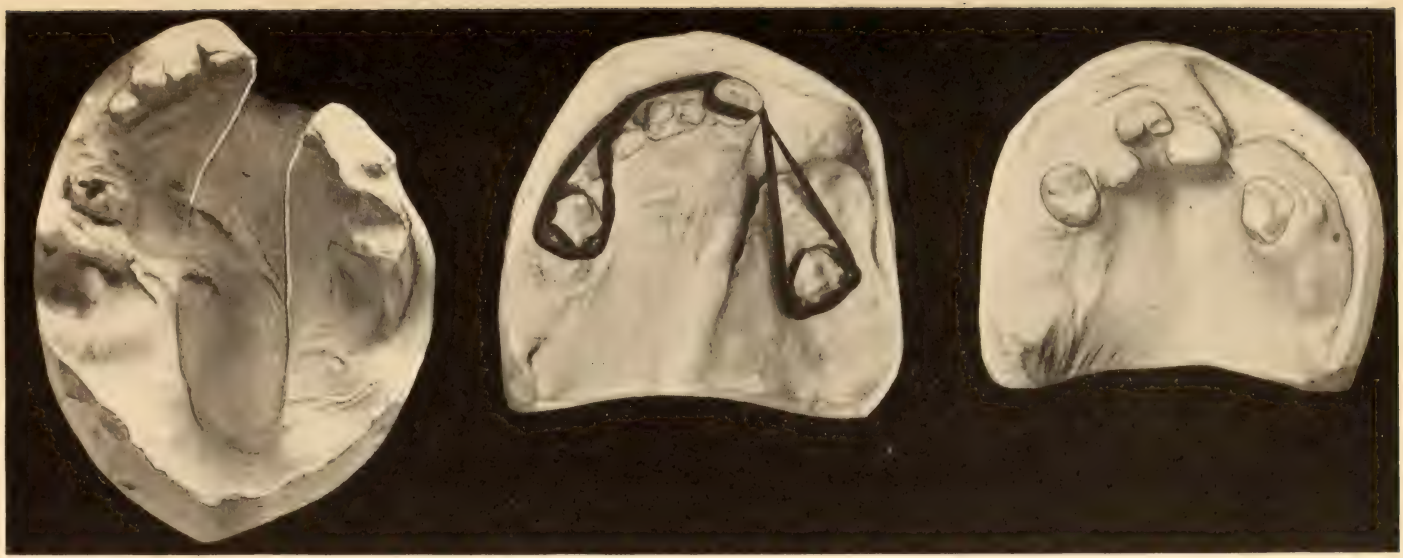

Fig. 8.—The first cast shows a wide unrepaired cleft at the age of eighteen months. The cleft is partially filled by a transverse part of the nasal septum that would prevent the maxillary bones from being drawn together (see Fig. 12). At the first operation this transverse part of the nasal septum was removed and the palate repaired by a von Langenbeck operation. As a result of the traction of the soft tissues across the bony cleft the palate became narrower (shown in cast No. 2 made three months later), but there was still a wide separation. Dr. F. J. Brockman constructed the orthodontic appliance shown on cast No. 2, with which, by means of an elastic band, the alveolar cleft was closed in two weeks, as shown in cast No. 3. Then the lip repair was made.

Fig. 9.—This cast, made from the teeth of a child five years old who had a Brophy operation for complete single cleft at three months, shows a complete loss of teeth on one side with no destruction of the teeth of the other side. This illustrates that a Brophy may or may not injure the tooth buds; depending, probably, upon just how much they are damaged in putting the wires through the bone.

Fig. 10.—Coronal section through casts of the upper and lower jaws in a case of complete, single cleft. Notice that the alveolar process of the upper jaw lies to the buccal side of the lower which is the reverse of the normal. A Brophy strives to partially correct this and not to unduly contract the upper jaw.

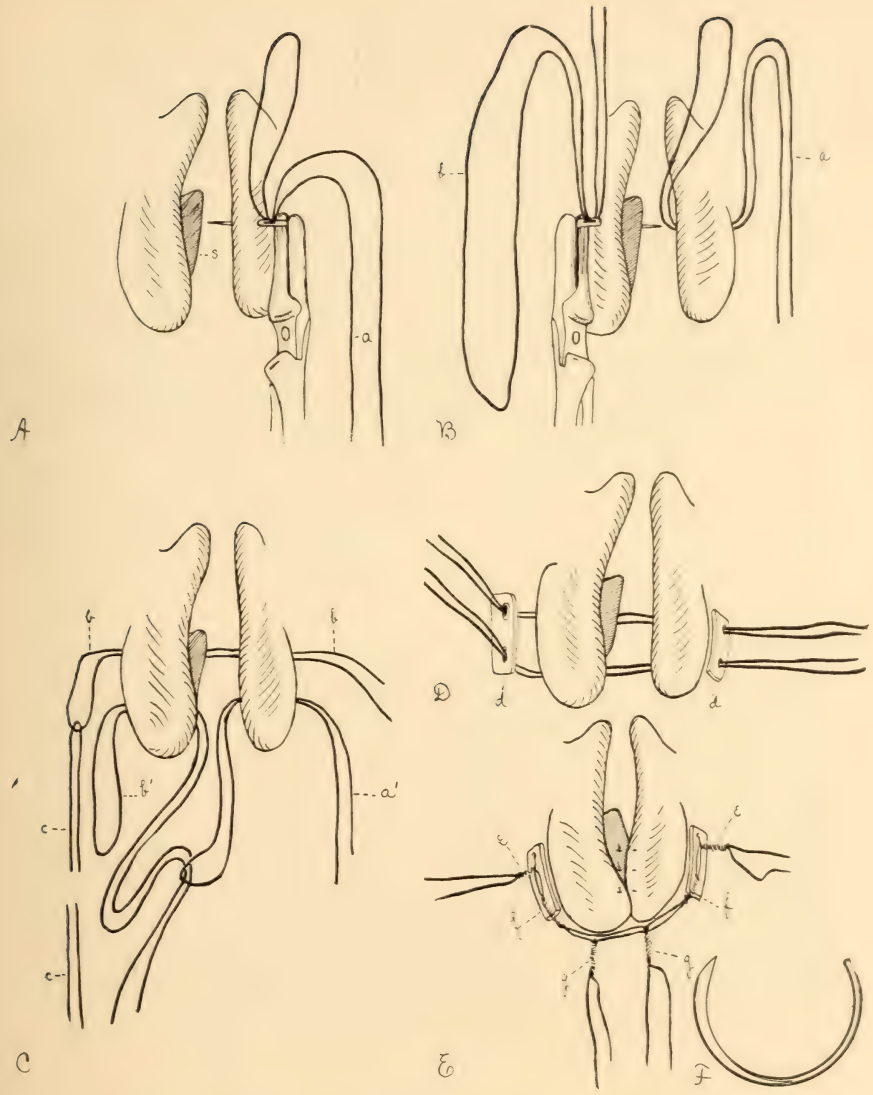

FIG. 11.—Approximating the maxillæ by through-and-through wires. *A*, first step, placing a heavy silk loop through one maxilla posteriorly. *B*, second step, placing a heavy silk loop through the other maxilla posteriorly. *C*, anteriorly is shown how one loop (*a*) is passed over the ends of the second loop (*b*). By drawing on the *a* loop the *b* loop is made to traverse both maxillæ; *b* shows loop in position with wire; *c*, ready to be drawn in place. *D*, showing two double wires in position, threaded at each end on a lead plate (*d*). If single wires are used, No. 20 is the proper size, while No. 22 or 24 is used double. *E* shows the maxillæ approximated. This is done by pressing the bones together and taking up the slack by twisting appropriate wires. The approximation of the alveolar part of the cleft is made more sure by bringing two of the wires around the intermaxillary bone and twisting them at (*g*–*g*). The extra posterior wire is discarded if not needed. *F*, the needle we use in piercing the maxillæ is what is known as 5/8 circle, reverse-eyed Hagedorn. We use two sizes; one of a circle the size of a nickel and the other of a circle the size of a quarter. Usually we grind off some of the broad cutting point.

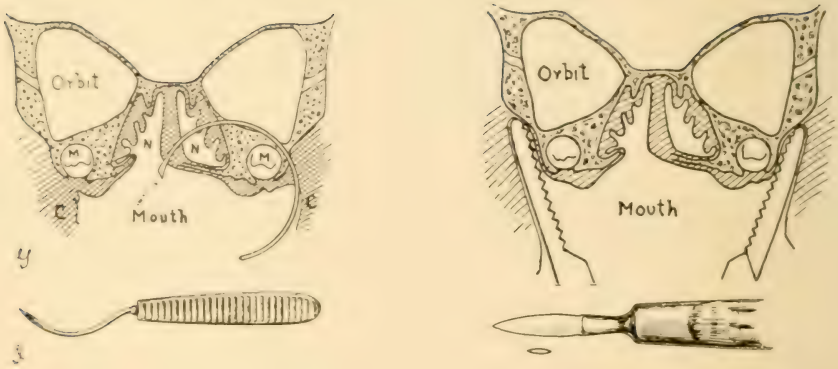

Fig. 12.—*G*, an accurate diagrammatic reproduction of a section of a frozen head of an infant with a single cleft of the palate. This illustrates how a 5 8-circle needle can be made to pass from the upper buccal fornix, through the jaw bone, along the floor of the orbit and into the cleft. *H*, showing position of the jaws of the forceps in forceful approximation of the maxillæ. *I*, Brophy needle. Dr. Brophy has two of these made, right and left. The shank of this needle is shorter than the original instrument. The use of Brophy's needle is simpler than the author's method, but the latter insures placing the wires at a higher level in the jaw, *i. e.*, above the tooth buds. *J*, double-edged knife we occasionally use in cutting the maxilla. The knife is thrust high into the body of the bone through a small mucous opening, and moved forward and backward in the bone.

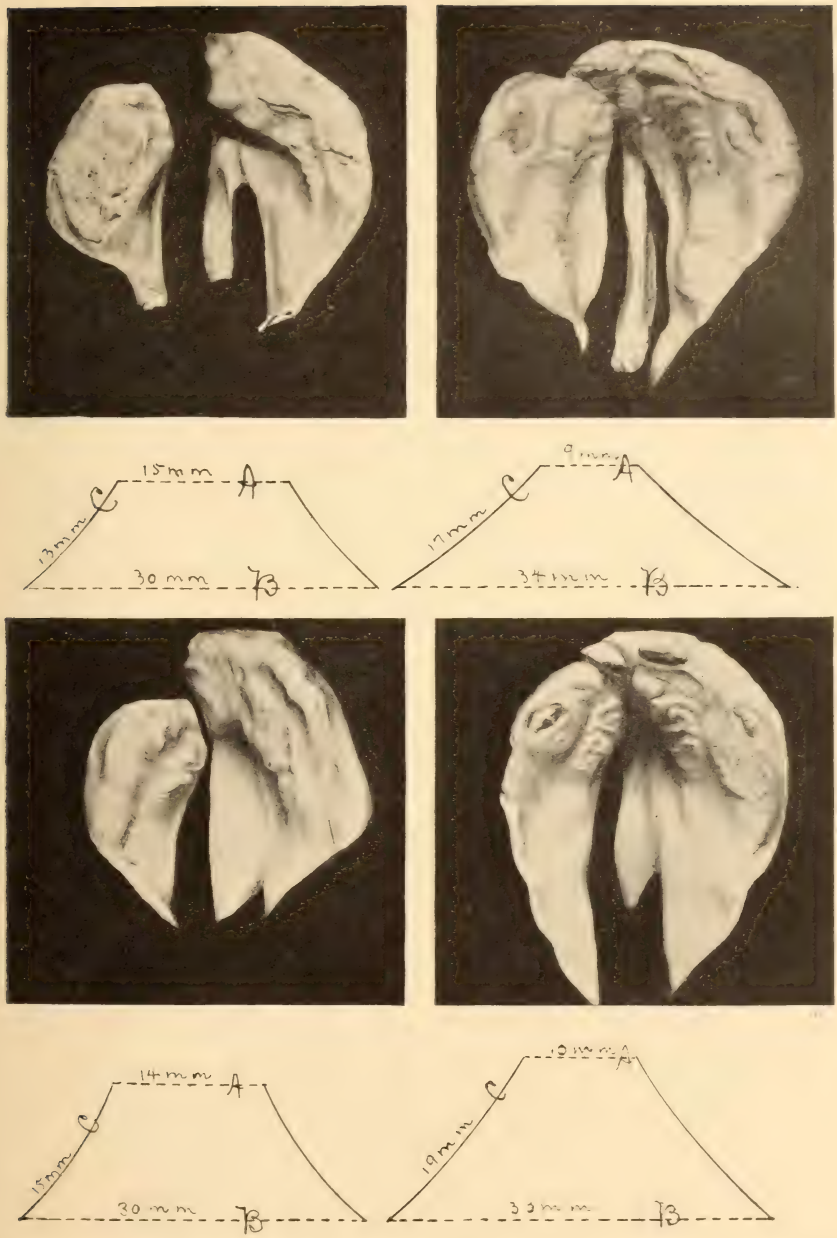

FIG. 13.—The two casts in the top row show a case in which the alveolar approximation was made by a single wire passed through both maxillæ and twisted around in front of the premaxilla while in the case recorded by the two lower casts a typical Brophy was done, which, though it gives a better position to the premaxilla, has little ultimate effect upon the width of the posterior part of the cleft. This will be appreciated by a study of the diagrams below each cast which are supposed to represent coronal sections through the casts at the posterior border of the hard palate. These give, in millimeters: *A*, the width of the cleft; *B*, the distance between the alveolar processes (the space that will be filled by flaps in the subsequent von Langenbeck operation), and *C*, the amount of available palate tissue from which the flaps are obtained. It will be seen that the width of the cleft and of the posterior part of the hard palate has decreased and the available palate tissue has increased about the same amount in each case regardless of the type of operation.

Fig. 14.—Shows on the left a proper and on the right an improper position of the premaxillary bone after the closure of the alveolar cleft. In the latter instance the anterior part of the palate cleft remains wide and difficult to close and is apt to be accompanied by a flat upper lip. (See Fig. 18.)

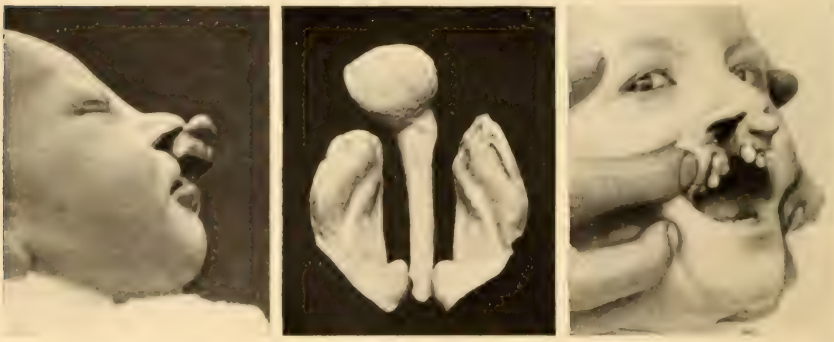

Fig. 15.—The first two figures are a photograph and a cast of complete, double cleft, showing the typical forward position of the premaxillary bone and prolabium. If this is left unoperated this position will persist, but an early correction of the position of the premaxilla will be followed by a proper development of the columella and tip of the nose without the aid of any special plastic for this purpose. (See Figs. 19 and 20.) The third picture is of an unoperated case, twelve years old, showing that no spontaneous change has occurred in the relative position of the premaxilla.

Fig. 16.—In shortening the nasal septum it is usually sufficient to make a simple submucous incision through its bony lower border along the dotted line indicated in the illustration, but this may be followed by a temporary obstruction of the nasal fossæ which causes nasal mucus to drip over the newly repaired lip which in turn makes infection of the lip wound more likely, therefore a submucous resection of 5 mm. of the lower border of the septum usually is preferable.

Fig. 17.—In the cast in the first case a proper relationship is shown between the premaxillary and the maxillary bones, the latter being drawn close together in front so that the premaxillary rests in front of them. This gave the good lip shown in the photograph to the right. Notice how the plane of the upper lip is in front of that of the chin which is correct in a baby. In the case represented by the lower row of pictures the premaxillary bone has been allowed to slip back between the maxillæ which gives a wide anterior part of the palate cleft, very difficult to close, and the very ugly flat upper lip which is on the same plane as the chin. By our best efforts it is not always possible to avoid the latter fault, but it can later be corrected by orthodontic procedure.

FIG. 18.—The face to the right shows the facial deformity that may result from placing the intermaxillary bone too far back, while in the one to the left the intermaxillary bone has been removed. The latter procedure cannot be too strongly condemned. In the first instance the defect can be corrected by orthodonture, while the appearance of the second case can be greatly improved by prosthesis.

FIG. 19.—Shows two babies having a recent proper operation for double harelip with protruding premaxilla and prolabium. Notice the snubbed nose and slit-like nostrils which will correct themselves. (See Fig. 20.)

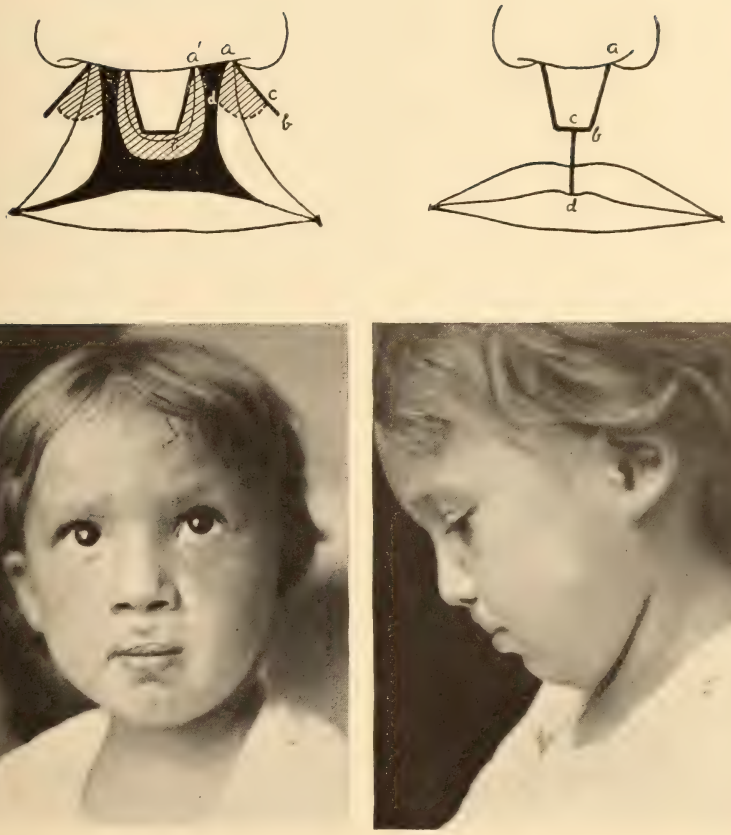

FIG. 20.—Showing a modified Maas operation for double harelip which for want of a better designation we have called the Washington University operation. The child shown below had this operation done in early infancy and at first gave the appearance shown in Fig. 19, but notice the beautiful development of the nose that has taken place spontaneously. The defect in the middle of the lip is due to inadvertently leaving a slight bit of the vermilion border of the prolabium.

Fig. 21.—Shows the Rose operation for double harelip and a case so treated. The second picture in the series shows the distortion that immediately resulted but the other two show the good later results. The only fault here is that the upper lip was made a little too long; a mistake very easy to make.

Fig. 22.—A Rose operation is best suited to correct most malresults for lip operations, and poor results following a Rose operation are more easily corrected than after any other type of operation. The illustrations are from casts of a young lady who had had a very faulty lip operation in early infancy.

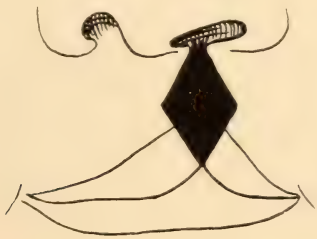

Fig. 23.—Some operators prefer to modify the Rose operation by making angular cuts as shown above.

Fig. 24.—In the presence of even slight lip notches there is usually a spreading of the nostril of that side which should be corrected. Therefore a typical Rose operation is done in these. (See first cut in Fig. 28.)

FIG. 25.—Where there is a harelip and an alveolar notch with the premaxilla overriding the maxilla, as shown above, it is better to disregard the alveolus and simply repair the lip, leaving the subsequent malocclusion to be corrected by the orthodontist. It was our former custom to immediately bring the alveolar parts into proper relationship but this, the writer is now convinced, was a mistake.

Fig. 26.—Two photographs taken at slightly different angles showing Rose incisions for single, complete harelip. These are depicted here chiefly to show the relation of the upper portion of the incisions to the nostril. On each picture the head is tilted back somewhat, which causes a fore-shortening of the incisions.

Fig. 27.—Shows obstruction of the patient's nostril caused by removing tissue that should have formed the floor of the nostril. (See Fig. 26.)

FIG. 28.—Showing the incisions for a Rose operation for complete and incomplete, single harelip and a case so treated ten days after operation.

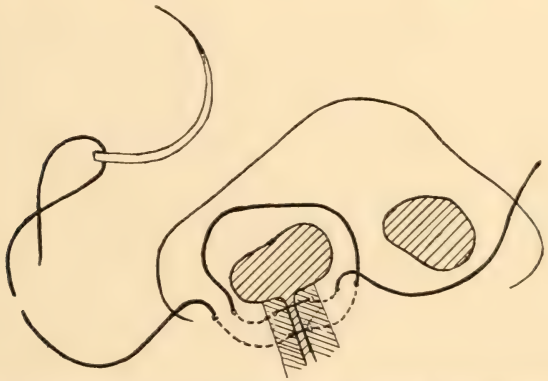

FIG. 29.—Figure-of-eight suture for bringing the columella and ala into proper relationship and for preserving the full thickness of the lip at this point.

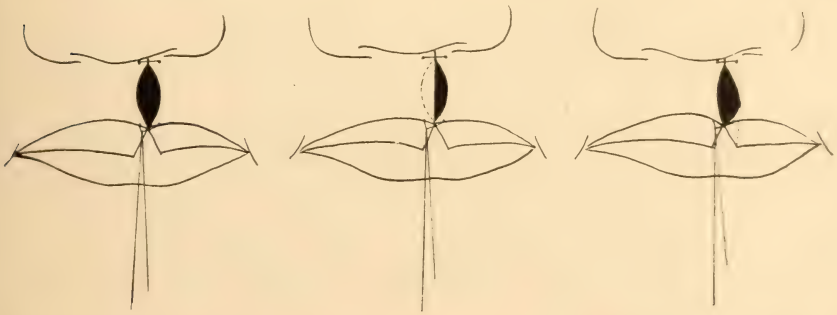

FIG. 30.—After placing the figure-of-eight suture at the entrance of the nose and a simple suture at the mucocutaneous border and then drawing, gently, downward upon the latter there should be an elliptical gap, with symmetrical borders, that is to be closed by cutaneous sutures. If it is found that one border is shorter than the other, first it is determined if one is too short or the other too long and then dealt with as suggested in the other two figures; cutting along the dotted line through the full thickness of the lip. The central figure shows the method of lengthening the short segment of the lip, while a cut made through the dotted line, in the figure to the right, will shorten the lateral part of the lip. Both sides may be shortened or lengthened in the same way.

Fig. 31.—The deformity shown in the first picture is the result of making the mesial incision too short, *i. e.*, not sufficiently convex. In the second picture the distortion is due to making both incisions too short. In the third picture both incisions were made too long, *i. e.*, giving them too much convexity. All the defects here shown are somewhat exaggerated by the camera.

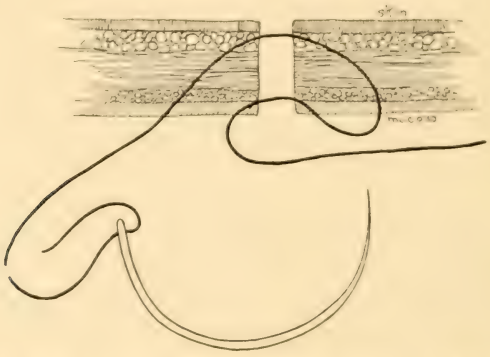

Fig. 32.—After both the cutaneous and mucous surfaces of the lip are accurately approximated by fine interrupted sutures, then in the fleshy part of the lip are placed one or possibly two of these modified Lane sutures of silkworm gut, tied on the mucous surface. This suture insures the accurate approximation of the muscular surfaces, controls bleeding and bears the brunt of the strain; the two ends are left four inches long so as not to fall into the mouth and are not knotted together, otherwise the child might catch its finger in the loop. Care must be exercised in removing this suture; the knot might be cut off and the loop left in the lip.

Fig. 33.—The figure-of-eight suture placed at the entrance of the nostril is not sufficient to prevent a subsequent spreading of the ala. Garretson devised the plan of placing a silver-wire suture through the lip, shotted at each end over lead plate. If there is no infection this is effective, but in the presence of a mild infection the wire rapidly cuts through the flesh; therefore we have of late supplemented this by the adhesive straps, shown in the illustration, which also are old. The adhesive straps of themselves are not very effective. Any support resting on the suture line is very objectionable.

Fig. 34.—Lip clamped with Halsted forceps to control bleeding from the coronary arteries. The procedure will save some blood.

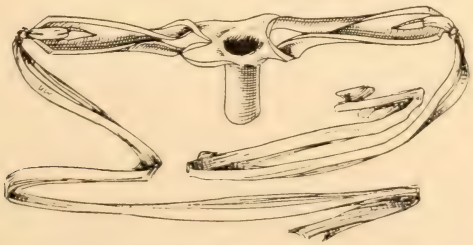

Fig. 35.—Shows a breathing tube of soft-rubber tubing, described in the text.

twisted around in front of the premaxillary process is not as satisfactory as when combined with two wires traversing the maxillæ and twisted over lead plates, because the former too easily cuts through the bone and tends to push the premaxillary process back into a bad position. Under no circumstances is the premaxilla to be removed (Fig. 18). Various operations have been improvised for the lengthening of the columella in cases of double harelip where the prolabium and premaxillary bone stand out on the end of the nasal septum, with apparently no columella present. The writer's observation is, that when attempted they are mutilating and further, with early operation, they are absolutely unnecessary (Figs. 19 and 20). If the maxillary and the premaxillary processes can be brought into good relationship, the borders of the alveolar cleft are freshened to the periosteum so that firm union will follow. If for any reason the palate cleft cannot be sufficiently narrowed by immediate pressure, then it is better not to freshen the contact edges, for, after repairing the lip, further narrowing will take place from cheek pressure. If in a single cleft, by the use of thumb pressure and crushing forceps, the premaxillary can be brought in front of the maxillary process and tends to stay there with not more than 3 mm. separation, then it is the writer's custom to repair the lip without the use of the wires, thus assuring the integrity of the tooth buds. If this procedure is adopted with a double cleft, the nasal septum should not be cut at this operation. In cases where the alveolar cleft borders have not been freshened at the original operation, firm bony union may be induced, after cheek pressure has brought the borders into contact, by passing a flat-bladed electric cautery into the cleft. It is Brophy's custom, at the first operation, to approximate the bones, freshen the contact edges and tighten the wires, postponing the lip repair to a subsequent time. It is the writer's custom to do the lip at the same

sitting, believing there are several good reasons for so doing, but, if the infant's condition does not seem fit after the bone wiring, the lip operation may quite properly be postponed.

It is the writer's belief that there are many advantages to the "Brophy" type of operation and, when properly performed, but one legitimate objection. It increases the tendency to premature eruption, or early decay of the deciduous teeth. When carefully done this is not apt to be serious, but when the tooth sacs are ruthlessly punctured, broken, or cut with wires, the loss of teeth may be very great (Fig. 9). The alleged objection that it causes an undue narrowing of the nasal fossæ and palate has no substantiation when the operation is correctly performed (Fig. 10).

The "Lane" type of operation does not give so perfect anatomic results and is less apt to be successful than the "Brophy" combined with a "von Langenbeck" operation, and it is at least equally disturbing to dentition.

The preferable time for closing the palate cleft proper is between ten months and two years; and at this period it can be best done by a "von Langenbeck" operation, which at this age closely reproduces the natural anatomic arrangement.

Restoration of the Lip and Nostril. Of the numerous plans which have been proposed for this purpose a "Rose" type of operation is the simplest to plan and execute and is capable of giving the best anatomic results (Fig. 21 and 28). Last but not least, disappointing results which will occur are more easily corrected after this plan of operating than any other (Fig. 22). Many operators use an angular in place of the curved incision of a typical "Rose" operation, but the principle is the same (Fig. 23). For complete double harelip the author prefers the plan that somewhat resembles a "Maas" operation (Fig. 20),

but even in the double cleft the "Rose" operation is efficacious and, unless one has special skill, is apt to be more satisfactory in the result (Fig. 21).

Operation for Single Harelip. If this is accompanied by a complete palate cleft, the alveolar portion is to be dealt with according to one of the plans already given. In a simple alveolar cleft, without complete separation, the alveolar process needs no special treatment (Fig. 25). Whether a lip cleft is complete or only a notch, the plan of operating is the same, for incomplete clefts are accompanied by a spreading of the nostril on that side which should be remedied (Figs. 24 and 28). The following points should receive special attention during the operation:

(*a*) Incisions should be carefully planned and then plainly outlined with the point of a knife.

(*b*) Unless varied for some special adjustment, the cuts should extend squarely through the full thickness of the lip. A sharp, long, straight bistoury is preferable for the purpose.

(*c*) On neither side of the cleft does the incision really enter the nostril, but it should end at the level of the junction of the columella with the lip on the mesial side and of the ala with the lip on the lateral side; the upper ends of the incisions run almost transversely (Fig. 26). One is rather apt to run the incisions somewhat upward along the inner surface of the ala or septum, which will cause an internal obstruction of the nostril most difficult to correct (see Fig. 27). Just at the entrance of the nostril the incision should run sufficiently close to the ala on one side and the columella on the other, so as to bring them close enough together to make a nostril of a proper size (Fig. 26).

(*d*) In doing a "Rose" operation the convexity of the curved incision should extend laterally to the fullest width

of the cleft defect, and each curved cut, if drawn out straight, should be of the same length as its fellow of the opposite side.

(*e*) The length of the cut within the vermilion border should correspond to the width that it is desired the vermilion border should be at the completion of the operation (Figs. 28 and 31).

(*f*) The ala is approximated to the columella by a deep suture of paraffined silk, placed just below the ala and the columella; this includes the full thickness of the lip and a superficial stitch that accurately approximates the skin. These are best combined in an inverted figure-of-eight suture (Fig. 29), that is drawn up tentatively, first observing whether the ala is brought to a level symmetrical with its fellow of the opposite side. If this is not the case the suture is removed and replaced; then it is necessary to see that the cut edges of the skin in the floor of the nostril abut fairly and do not overlap. If this should not be the case, a superficial stitch of silk or horsehair is placed in the skin above the figure-of-eight stay suture and immediately tied; the figure-of-eight suture is then tied, the ends being cut short.

(*g*) A somewhat superficial suture is put exactly through the mucocutaneous border and before tying this gentle traction is made downward to see that both freshened borders of the cleft are of the same length (Fig. 30).

(*h*) The skin and mucosa of both surfaces are now accurately approximated by several superficial interrupted sutures of horsehair or fine silk, the ends of all being cut very close to the knots.

If the ala has been brought into proper relation to the columella, any present kinking of the nostril had best be disregarded, for it is rapidly and more accurately corrected by growth than by a plastic on the ala. When finished, the two halves of the lip should be symmetrical, with

neither a notch nor a protrusion at the line of union. It has been the writer's observation that a lip, that is slightly short at the suture line, tends to correct itself with growth; that if it is made too long, or with a protrusion, these faults tend to persist. With this type of operation, either a moderate notch or a protrusion are easily corrected at a subsequent operation. After the superficial suturing is completed, two deep stay sutures are placed, one on the mucous surface of silk-worm gut (Fig. 32) a little above the mucotaneous border, its ends being left free and 4 inches long; the other of No. 26 silver wire is placed through the upper part of the lip and shotted over lead plates that rest on the skin (Fig. 33). If no infection takes place, these are sufficient. The lower part of the lip usually holds; in but two instances in the writer's practice have infection and tension combined been sufficient to cause a separation here. The greatest tension is in the upper part, the silver wire suture having a tendency to cut, thus allowing one or both nostrils to spread. For this reason it is advisable to further support the face by adhesive strapping (Fig. 33).

Double harelip, complete or incomplete, is almost as well treated by the "Rose" operation as the modified "Maas" operation used by the writer (Fig. 20), and its execution is more simple. The prolabium is cut to a point and the curved incision is made in each lateral piece of the lip, after adjusting both nostrils as described in taking care of a single harelip. The mucocutaneous border suture is placed, the lip is drawn down to the proper length, and the remaining sutures put into place. The same precautions are observed as in repairing a single harelip, and what should be remembered is that a double operation is much more of a strain on the child, and possibly more so on the operator, than the single cleft operation. Both operations are completed by putting a modified "Lane" suture in the

lower third of the lip and a lead plate suture below the level of the nostril, and then strapping the face.

Of the foregoing methods it can be said that each of them has at some time been discarded or criticized by men of large experience; but the combination here set forth is the one at present used by the writer and the one that has given him the fewest unsatisfactory results. Each step is the survival of several that have been from time to time adopted in the attempt to overcome a particular source of disappointment.

Having completed the lip, two special points should receive careful consideration: hemorrhage and respiration. Proper suturing should control all lip bleeding. If necessary, one or more silk-worm gut sutures may be placed through the full thickness of the lip and tied tightly on the outside, to be removed in twenty-four hours. Considerable blood may be lost during a careful paring and suturing. The plan shown in Fig. 34, and the free use of mosquito forceps, will help some. Babies between three and ten days of age are almost without exception more or less jaundiced.* These babies not infrequently bleed from needle holes in the bone. Either this persistent bleeding or moderately severe loss of blood at operation is best treated by injecting 15 Cc. of fresh (preferably mother's or father's) blood into each axilla under the pectoral muscle and massaging the spot vigorously until the blood is disseminated.†

Breathing. The tongue tends to obstruct satisfactory respiration through the mouth in the young infant. For a

* This is evident in the bloodless tissue removed in freshening the cleft border even when it is not observable by inspection of the child.

† The exact technic of doing this is to have two clean Luer or Record 20 c.c. syringes, with fairly large needles. The blood is drawn from the donor as in taking blood for the Wassermann reaction, and immediately injected into the already prepared axilla. The whole operation should require less than a minute for each side.

few days after a lip operation both nostrils may be occluded by suture pressure or by secretion, evidenced by a sucking in of the lower lip during inspiration and later by restlessness. If this is not compensated for, the infant loses weight and may do badly. The most satisfactory way to deal with this condition, the writer has found, is the use of the breathing tube shown in Fig. 35. This is worn for three days, being removed twice a day to be cleaned. The baby is fed through the tube. After three days the nostril usually opens or the child learns to breathe through its mouth.

After-treatment. Two ounces of plain water is at once placed in the rectum. As soon as the baby recovers sufficiently, usually after an hour, one drachm or more of castor oil is given by mouth to clear out blood that has been swallowed. An hour or so later regular fluid feeding for a baby of its age is started. A nursing baby is put back to the breast in two days. The mouth is frequently irrigated with saline, and, in puny babies, frequent examination is made for thrush. The nostrils are kept scrupulously free from crusts, being cleaned by the nurse every few hours if needed. The lip, also, must be kept rigidly free from crusts. The silk sutures are removed in four to six days, the lead plate suture in eight days, and the "Lane" suture in twelve days. If infection at the suture line tends to ulcerate the skin, xeroform ointment is used. An abscess about either stay suture usually discharges in six days without doing damage.

All babies are operated under a light ether anæsthesia, lying on the back with head over the end of the table, the head being supported by the operator's knee or an assistant's hand.

DISCUSSION ON THE PAPERS OF DRS. RANSOHOFF AND BLAIR

Dr. John Staige Davis, Baltimore.—Dr. Blair's paper has been of great interest to me because I have many of these cases to deal with.

As to the time of operation, I have given up operating within the first few days. I see no reason why we should not wait, at least, six to eight weeks, and sometimes considerably longer, depending upon the condition of the child. I have also abandoned the bone cutting operation. If you close the lip over a cleft which extends through the alveolar margin the appearance will be unsatisfactory when the operation is completed, but in the course of a few months, in the majority of cases, you will find the cleft, which may be a centimeter and a half wide in front, will be much less wide, so that the palate which previously would have been difficult to close, can be closed by the Langenbeck operation or some modification of it without difficulty.

In order to get the denuded edges of the lip of the same length, the clamp devised by Dr. Ladd, of Boston, seems to be very satisfactory. Dr. Ladd measures his distance with dividers, then applies an angled slit clamp on each side. Then with a double edged knife he cuts along the slits and gets a symmetrical edge on each side, which puts the tissues opposite each other in the proper places.

I have never done a Brophy operation myself, so that I cannot speak from personal experience, but I have seen so many unfortunate results following this type of operation, that when I began this work I made up my mind that the Brophy operation, except in his hands, was not the proper one. As to the time of operating for cleft palate, I see no reason to operate earlier than eight months, and usually advise the work to be done between the first and second year, as you get better tissue to work with, and the after results are equally satisfactory.

Dr. James E. Thompson, Galveston, Texas.—I have listened to Dr. Blair's paper with a great deal of pleasure. Every time Dr. Blair gets up to speak, he gives us something new to think about. I have only one objection to his paper which is that he has not gone far enough. There are many points I am anxious to get information about and I hope that he may touch on some of these in closing the discussion.

As regards the repair of the lip, the question of measurements can be settled easily by a simple procedure which I described before this Association a few years ago. If this method is followed, the lip is repaired in a manner so accurate mathematically, that no mistakes can possibly be made. The nostril will be formed perfectly and the red line of the mucous membrane will correspond on both sides of the union.

As regards the operations on the palate, I think most of us have gone through various phases and have employed many operations. Many years ago, I was accustomed to perform the Lane operation. I succeeded in closing the palate by this method in a very satisfactory manner. The functional results, however, were invariably bad. The soft palate was hard and cicatricial and I do not believe in a single case that I succeeded in getting the palate soft enough to be applied to the posterior pharyngeal wall during speech. Recently I have been performing the Langenbeck operation or Berry's modification of this operation. A number of years ago, I performed the Brophy operation and my experience with it was such that I have been afraid to use it. At the time, I am afraid I did not understand all the principles involved and attempted to do the operation on a patient much too old. Recently, I have been closing the palate in the following way:

As early as possible, I operate upon the lip and at the same sitting I force the two halves of the maxillæ together with my thumb and fingers. I then pass a strong kangaroo tendon through the approximated maxillæ to hold them in contact. It is needless to say that this approximation concerns the anterior portion of the maxillæ only. I have never been able to make the posterior portions slide together. I have been able to tilt the alveolar borders nearer to one another but never to obtain satisfactory sliding. In cases of single harelip associated with a simple cleft between the maxillæ, the edges of the maxillæ are denuded and the denuded ends brought together. This concludes the first operation. A few months afterward the palate is repaired. This can usually be accomplished with very little difficulty by Berry's method (without the side incisions) or by Langenbeck's method (with the side incisions). I have found that when the side incisions are not employed that the button sutures of Brophy are of very great value. If properly placed and fastened with the right degree of tension the sides of the soft palate are held in perfect apposition without any

possibility of separating. These button sutures will do away entirely with the division of the tensor and levator palati muscles which is often necessitated in the Langenbeck operation. In many instances I do not hesitate to divide the palatopharyngeus muscles. I have found that this liberates the posterior edge of the soft palate to a surprising degree.

Dr. Edward H. Ochsner, Chicago.—One of the most disappointing and distressing things in lip operations is, after approximating the parts perfectly, to have ugly little white stitch marks persist. In order to overcome this, I devised a method of treatment about fifteen years ago which I believe is valuable. These little white scars are due to infection with the skin staphylococcus. After approximating the parts carefully without tension if one will simply paint the wound with a solution of liquid benzoin evaporated down to a consistency of ordinary molasses, one can always avoid these little marks. The skin staphylococcus is an aërobe and by cutting off the air, it will not develop and the scar will not show.

Dr. J. Shelton Horsley, Richmond, Virginia.—There are one or two points I wish to speak of in connection with Dr. Blair's paper. First of all, I want to congratulate Dr. Blair on the excellent work he has shown.

I have tried the Brophy method but my results have not been very satisfactory. I have tried a slight modification which I thought of some advantage, that is, using thin rubber bands put through instead of wire and fastened over an aluminum plate just above the alveolar border. It brings the cleft together very nicely, but the constant pressure from the elastic produces necrosis and infection where the plates are.

One thing about harelip which Dr. Blair does but did not mention is that one of the most important things is not only placing the incision but securing thorough mobilization of the parts. Unless you dissect free the attachment to the cheek and ala of the nose the ultimate result is probably going to be unsatisfactory. If you do have the parts well mobilized and make a poor lip incision, you get better results than with an accurately placed incision without mobilization.

In regard to infection, we dread it after a cleft palate operation. It is difficult to manage. I have recently adopted the old method of using very fine silver wire, No. 29 or 30, and I think it is probably quite an important step toward preventing infection, as we know that silver wire is mildly antiseptic, and

no other suture will retain its antiseptic properties for any length of time.

Dr. Joseph Ransohoff, Cincinnati, Ohio.—The most interesting point to me in the excellent paper of the essayist was the importance laid on the variation of the pyramidal shape of the lip. A thing that we have dreaded is that the upper lip of a child who has been operated on does not look like the ordinary lip of a baby at all. These children we have all seen pictures of had the chin sticking out and the lip was merely a band across covering the alveolar border.

With regard to the type of operation, I think the whole world is indebted to Langenbeck for insisting on early operation in these cases. I happened to have heard a lecture by the elder Langenbeck on this subject, and saw him operate for harelip in children six and seven hours after birth. The information was circulated by many midwives that just as soon as a child was born with harelip or cleft palate, that child was to be rushed at once to Langenbeck's clinic, so that operation could be performed early. He did not operate upon anything but harelip. He believed the right thing is to operate on the anterior portion of the cleft in children only one or two years of age. The laity knows these cases must be operated on early. The mothers themselves in the neighborhood insist that a child with harelip should be operated on early. They imagine that maternal impressions might have some effect if these children are not operated on early, We all know, of course, that maternal impressions must be started earlier to do any good. The fact of operating early in these case of cleft palate is insisted upon in order that the voice shall be properly formed or trained. Late operation does no good except in an anatomical way. I am in a small way illustrating this in my lectures by mentioning the case of a boy operated on when twelve years of age. I am in the habit of doing it in this way: before operation I would put the boy in the corner of a room a distance of 20 feet and ask him, "What is your name?" He would say Harry Hoffmeyer. The operation anatomically was a complete success. After the operation I would put him in the corner of a room at about the same distance and again ask him his name to show the difference in speech before and after operation.

Dr. William R. Jackson, Mobile, Alabama.—I would like to ask Dr. Blair if he only does semicircular denudation or brings the apex of the lateral flap to a point to make it broad

in the middle of the lip as I have seen in many of these operations But the difficulty is to make the proper length of triangular flap denudation and then pull that down and let the apexes come together.

I would like to ask what technic he uses to co-apt the soft palate and hard palate tissue, whether he passes the sutures through the median line and repairs the median line only or does he pass sutures with lead plates or lead buttons on the side?

Dr. William A. Downes, New York City.—In the closure of harelip, in an experience extending over a good many years, I have used a double layer of stitches, a deep layer of fine chromic catgut, including mucosa and about half of the muscle of lip so tied that the knots are on the inside and a superficial layer of very fine stitches of silk or horse hair. By using this method of suturing scarring is reduced to a minimum. None of the cases in which it has been used have come apart nor is it necessary to put any dressing on the lip other than a weak solution of iodin and cover it with boracic acid ointment. The stitches are removed at the end of the fourth day at the outside, and the results have been satisfactory.

I have used the Brophy operation in 4 cases, but have given it up as I had necrosis in 2 cases probably due to faulty technic. I used the Lane operation up to two or three years ago, but gave it up on account of the short contracted soft palates which resulted from its use.

The Langenbeck operation preferably in two stages is the operation of choice.

Dr. Blair (closing).—I think the Brophy operation is the best procedure for closing the cleft in young infants, the earlier it is done the better and when properly done there is no need of undermining the lips. For closure of the velum and posterior part of the hard palate I do a von Langenbeck operation, taking the greatest care to preserve the posterior palatine arteries and in a way disregard the other tissues. I use no supplementary supports, such as the tape used by Dr. Mayo or the lead plates of Dr. Brophy.

Some years ago Dr. Gilmer, of Chicago, whom I believe is the greatest living oral pathologist in this country today, said to me "since I have been very careful about covering my face when doing palate operations I have had fewer infections." It took five years for the significance of that statement to register with me, to recognize that the streptococci I had in my nose

and mouth were a different type than those found in a baby's nose and mouth and probably much more virulent, and that talking while working in a baby's mouth, even with a piece of gauze over my mouth, these organisms might be transferred. Since I have been using a thick towel mask with lateral breathing openings I have had much fewer infections in palate surgery.

As to speech, I do not believe that a cleft palate child, as a rule, has any mental defects. If the palate operation is postponed until after two years there will be more or less speech defect. I believe one gets a better average speech after the anatomic operation of von Langenbeck than after any of the distorting operations. Speech defects can, as a rule, be much improved or eliminated by proper training.

TRAUMATIC ANEURYSM OF THE AXILLARY ARTERY: LIGATION OF THE SUBCLAVIAN. RECOVERY

By C. E. Caldwell, M.D.
Cincinnati, Ohio

Cases such as I herewith report must be of comparative frequency in the experience of surgeons during the present war in Europe, but in civil life are sufficiently rare to justify their presentation.

Wounds of arteries by bullets may result variously according to the nature of the injury inflicted.

A bullet may so slightly impinge on an artery as to inflict only a contusion of the coats of the artery, which contusion, if it involve the intima, may result in a thrombus with either gradual or sudden or incomplete or complete occlusion.

Again, the bullet may cause either partial or complete severance of the vessel walls. If the artery be small and the bullet of low velocity, there may result but slight hemorrhage, owing to spontaneous occlusion of the lumen.

If the artery be deep seated and remote from the wound of entrance, it may be that bleeding will not evidence itself at once, even when present to a considerable degree.

A thrombus formed in the path of the bullet may, and often does, act as an occlusive plug to prevent any external evidence of hemorrhage.

In such a case a large, deep-seated hematoma may form which is in direct communication with the blood current and pulsates synchronously with the artery, a so-called false aneurysm, or, better aneurysmal hematoma, or by thrombotic occlusion of the artery may have no communication with the blood stream. This latter condition results in a simple hematoma which in time undergoes thrombosis and absorption.

Again, a bullet may so impair the vitality of the vessel coats by destruction of the sheath, and injury to the vasa vasorum that subsequently an aneurysmal dilatation of the vessel walls takes place, a true traumatic aneurysm.

To just what category the case which I here report should be relegated I am unable definitely to state, as the situation of the tumor, together with its size, precluded a complete exposure and the recovery of the patient an autopsy.

Case Report.—E. B., male, aged twenty years; American; brewery worker. Admitted to my service in Cincinnati General Hospital March 3, 1916.

Family History. Irrelevant.

Personal History. Always well, with the exception of slight transitory ailments. Denies all venereal disease. Admits the use of alcohol and tobacco.

Onset. About fifteen minutes before admission he was shot in the right upper pectoral region while defending a woman from attack. The wound was dressed by a doctor on the outside and the patient was sent to the hospital in a patrol wagon.

Status Presens. Well-developed and well-nourished white male, aged twenty years. He was in a state of considerable shock. Temperature 95.6 degrees. Right outer subclavicular region showed a penetrating gunshot wound, from which there was considerable bleeding. There was much swelling about the wound of entrance but no pulsa-

tion in the swelling. The right arm, forearm, and hand were cold and pulseless. No pulsation in the brachial or axillary arteries could be obtained. Sensation was greatly diminished; hand was blue and congested in appearance. No emphysema about the shoulder or chest.

About the level of the axilla, and about one inch posterior to its lower boundary there was a large hematoma, in which a hard object could be palpated—no doubt the bullet.

There was no pulsation in this hematoma. Patient complained of great pain in the forearm and hand. No venous pulsation.

About 1 A. M., six hours after admission, pulse in the axillary and radial reappeared full and strong. Sensation was recovered in the hand, with disappearance of the cyanosis and coldness. Treatment, which had been morphin, with hot applications, was continued.

For the next nine days the history was uneventful and will not be detailed.

The morning of March 12, nine days after admission, the patient seemingly was in good condition.

In the afternoon of that day he again complained of great pain. Examination revealed a pulsating mass under the right clavicle at the junction of the middle and outer thirds, about the size of an egg.

Mass is pulsating and expansile, pulsation being synchronous with the heart-beat. Radial pulses are full and apparently equal; no venous pulsation.

Ice-cap was applied, sulphate of morphin gr. ¼, given hypodermically. Chest and axilla sterilized for operation.

March 13, 9 A. M. Patient operated under ether, drop method. Benzin-iodin sterilization.

Skin was drawn down over the clavicle and a free incision made through it and the platysma. The scalene muscles and brachial plexus were exposed.

Owing to the proximity of a large pulsating mass which

Wound of entrance seen under the right clavicle.

presented under the clavicle the subsequent steps of the operation were pursued with the utmost caution and not a little apprehension, as I did not know at what moment the field might be deluged with blood.

Keeping as far medianward as might be I endeavored to locate the pulsation of the subclavian beneath the lowermost cord of the brachial plexus.

For some reason this was not possible, and I was finally forced to resect the clavicle. This was done subperiosteally, and it, together with the subclavian vein, was drawn downward as far as the vein would permit.

The artery still being inaccessible the vein was carefully dissected away from its attachments to the clavicle, and drawn upward in the field.

This finally permitted me to isolate the artery, which was either anomalous in its course or had been dragged out of place by the tumor.

With the ligation of the subclavian all pulsation in the tumor ceased.

The clavicle was united with kangaroo tendon passed through drill holes and the periosteum sutured with iodin gut. The skin was closed with Michel clips.

The operation from the beginning of anesthesia lasted three hours. This length of time was due to several causes. The extreme caution necessary to avoid encroachment on the area of danger, the difficulty in locating the artery, and the delay necessitated in the resection of the clavicle, a delay increased by a faulty drill which refused to work.

The patient made a rapid recovery, the only disability being a slight impairment of function in the area supplied by the radial nerve, from which he has completely recovered.

There were several features in this case which are of interest. First, the obliteration of the pulse in the first few hours after the injury, with its prompt reappearance.

This may possibly be attributed to an effusion of blood in the sheath of the artery, the compression resulting therefrom being subsequently relieved by a diffusion of the blood. The appearance of a pulsating tumor nine days after the injury, which would rather point to an expansion of the injured coats of the artery in part at least rather than to the formation of a false aneurysm or aneurysmal hematoma, which it would seem would have formed more rapidly.

The paresis of the peripheral nerves, which persisted for some weeks after the operation, was due, no doubt in part, to the exuberance of callus about the severed clavicle, as it grew progressively better with the subsidence of the callus.

THE TREATMENT OF FRACTURES OF THE FEMUR, ESPECIALLY IN THE OLD

By George Tully Vaughan, M.D., F.A.C.S.
Washington, D. C.

Fractures of the femur are, of themselves, always serious injuries, and differ from fractures of the skull, which are serious only in proportion to the damage done the brain or vessels. Of all the bones in the body, this is the one whose fracture, independent of injury to surrounding or adjacent structures, is followed by the most serious results, whether it be neck, shaft, or extremity.

Fractures of the shaft are most frequent during the strenuous period of life, say fifteen to forty, while those of the neck are much more frequent after the age of forty, and especially in old women. Fractures of the neck occur occasionally in young children. For years the opinion has prevailed that the mortality in the old is very high, and that the only possible chance to save the patient's life is to adopt some form of treatment that will not confine the patient to bed.

The mortality is high under any method of treatment, not necessarily because of confinement to bed, but chiefly owing to the fact that the femur is the great marrow bone of the body, containing more fat than any other bone; therefore the patient is more likely to have fat embolism than after fracture of any other bone. I believe the most frequent cause of death is thrombosis, with embolism either from fat or blood-clot, and it is liable to occur in any

patient whether operated on or not. How much infection has to do with it is not known. In some cases it can be traced to a probable infection, in others there is no such probability. No doubt many of the cases of pneumonia, of arrested renal function, and of coma are due to emboli in the lungs, the kidneys, or the brain as the case may be.

The question of treatment is often a difficult one to settle. The surgeon wants to select the method which is least dangerous to life and at the same time the one which will give the best results in the broken bone, functionally and anatomically. The safest method, so far as life is concerned, is often the one which would inevitably give poor functional and anatomical results. Perhaps the method safest to life would be to make the patient comfortable, straighten and fix the limb without attempting to reduce the fragments by much extension, counterextension, rotation, and manipulation.

The result in such cases would be shortening and perhaps a lack of correspondence in planes and axes of the two segments, yet the functional result might be good in spite of the deformity.

On the other hand, under an anesthetic, to push, pull, and manipulate or to do an open operation and put in a bone splint or metal plate would probably give a perfect functional and anatomical result, but the danger to life would be increased. Yet the patient is usually willing to incur a slight risk to his life for the sake of getting a good and useful member, and he is quite justifiable in taking the risk. So in every case to the conscientious man it is a question of nice surgical judgment, and the surgeon should give the patient the same advice that he would take if he were in the patient's place.

In fractures of the shaft good results can sometimes be obtained by means of Buck's extension, Hodgen's and N. R. Smith's methods. Wires, nails, and screws alone are

not as desirable as plates, bands, bone splints, or interlocking.

My first choice of means to hold the fragments together was silver wire, which I soon abandoned for iron wire, which I found cheaper and stronger and no more likely to be followed by infection. In an article entitled "The Operative Treatment of Fractures, Especially of the Long Bones," published in the *Transactions of the Medical Society of Virginia,* 1906, and the *American Journal of the Medical Sciences* for March, 1907, I referred to over one hundred cases I had operated on, in most of which wire was used, and the various methods of using wire were shown by drawings.

Since then, with increased experience and observation, I use less wire and more of other means for maintaining coaptation. For oblique fractures the steel bands of Parham and Martin impress me as being superior to wire. They are very strong and are applied without drilling holes in the bone.

The metallic plates most commonly used are those of Lambotte and of Lane. Good results are reported from the use of both. I have not used Lambotte's plates because their size, covering something like one-third of the circumference of the bone, impressed me as more objectionable than Lane's plates, which are attached to a much smaller surface. The Lambotte plate, however, holds the fragments more securely, and there is less need of an outside splint when it is used.

The Lane plate gives good results in suitable cases and when properly applied. Like all other new things, new medicines, new instruments, new methods, new fashions, it has been used by men of poor judgment in unsuitable cases, and hence has received much adverse criticism—some of it by men who have never used it and are not competent to criticise it. It should not be used by a slov-

only surgeon or one who does not practise or have the facilities for ensuring the strictest asepsis. I have used the Lane plate in a number of patients with fine results. In some I have had bad results, but it would hardly be fair to lay the blame on the plates. For example, in a compound comminuted fracture of both bones of the forearm sent to hospital for amputation I decided to try to save the limb and applied plates to the broken bones. The patient did well for two weeks, but left the hospital against advice, had a bad infection, and finally suffered amputation of the forearm. However much room there may be for speculation as to what might have been, no fair-minded man would condemn the Lane plate for a failure to cure this case. Patients whom I plated years ago are going around attending to their business, and would not know of the presence of the plates had they not been told.

An instructive case is reported by the Vander Veers, of Albany, in the *Transactions of the American Surgical Association* for 1914: A man with both femurs broken practically alike was treated by reduction, a Lane plate on the right femur and plaster of Paris on the left side. The final result showed quicker and better union on the side of the Lane plate. The inevitable conclusion from this one case is that the plate properly applied does not cause delayed union. Many cases could be cited which confirm this opinion, especially experimental work, that of Hay Groves and others. We know that delayed union and ununited fractures were not uncommon in the days before open operation came into use. Warren reported a case of complete absorption of the humerus after a fracture.

I do not perform open operation or put foreign material in the tissues unless I think the indications therefor are clear and convincing.

Frequently after exposing the fragments by open operation they can be adjusted in such a manner as to stay in

place without other aid than that of external splints. For some years I have been using two methods to avoid the use of foreign material in the tissues, one of which I have never heard of any one else using, and that is to insert the sharp end of one fragment into the medullary cavity of the other until firm fixation is obtained without shortening of the bone. Sometimes, in order to accomplish this, it is necessary to shape the fragments to some extent with cutting forceps. The other method is to use an intramedullary splint of bone, preferably taken from the bone operated on. In case of the femur a fragment an inch or an inch and a half long and thick enough to fit tightly into the medullary cavity is removed from the bone a short distance from the site of fracture, but through the same wound, and then inserted into the medullary cavity of the two fragments. This is suited for transverse fractures and prevents overriding, but not bending, which is prevented by a plaster of Paris cast.

The first method is used in oblique fractures.

I have had no experience in the use of the Codivilla-Steinman method of extension by means of nails or skewers driven into or through the bones.

Fractures of the neck of the femur if impacted, with little or no deformity, should be treated by plaster of Paris from chest to toes on the affected side with the limb in the normal position of extension parallel with its fellow.

Fractures with separation of fragments should be treated by the Whitman method of abduction. Then if the roentgen ray shows the reduction unsatisfactory open operation should be done, unless there are contra-indications, and the fragments fixed in some manner which seems best. I have had the best results with steel screws, 3 or 4 inches in length, passed through the base of the trochanter major and the femoral neck into the head of

the bone. I have used nails, but think they are inferior to screws.

Ununited fractures of the neck should be treated in the same way. Plaster of Paris should be applied from chest to toes in all cases and kept on or renewed for a period of about three months, and no weight should be borne on the affected side for at least four months. I usually tell my patients with fractures of the neck that they may walk again after from six to twelve months. No one knows definitely when a broken femur will unite, and it is best to be on the safe side. Patients are quite comfortable in the plaster and should be frequently turned over on each side, and on the face, to prevent hypostatic congestion, and can be brought up in a slanting position by raising the head of the bed.

THE OPEN TREATMENT OF CERTAIN FRACTURES OF THE LONG BONES

By H. Horace Grant, A.M., M.D.
Louisville, Ky.

Since the roentgen ray is daily discovering to the layman what the surgeon has long known, namely, that nearly all results in fractures of certain bones and situations are more or less grossly imperfect, the current literature abounds with the reports of experiences with the open method of treatment of fractures. The practical side of the management of a concealed lesion by looking at it and giving it direct treatment shows up in strong contrast to older methods, and needs only to insure simplicity and freedom from sepsis to come into its own. So fully is the need felt not only by the "physician and surgeon" of the remoter districts but by the skilled surgeon himself, that a discussion of various views and references to the abundant literature is beside the interest of the question at issue. We all know that something is coming in the practical management of certain of these fractures, and a variety of opinions but obscures the problem. Just what fractures of long bones may be safely managed by external splints must depend on special circumstances and environments, but more particularly on the features in individual cases, *i. e.,* the evident accuracy of approximation, the surroundings of the patient, the accessibility to skilled help, and opportunity for hospital treatment. While these conditions in a way help to control any surgical treat-

ment, the necessity for overcoming the difficulties may determine the course. A short or crooked leg or arm, as the result of a fracture, leaves a permanent monument which neither the patient nor the surgeon can confront without a disagreeable reminder to the one and more or less persistent mortification to the other. Under good surroundings the skilled hand should be able to get practically a straight leg or arm of normal length in every fracture when the bones are not hopelessly comminuted, and nonunion in the normally healthy patient should be practically unknown.

Prominent in the recent literature are two articles upon this subject published in the *Annals of Surgery* for July, 1916, in both of which the open treatment is earnestly advocated after one method or another. In the article by Dr. Estes of South Bethlehem, Pa., a very full review of the various methods of the treatment of fractures is given together with some extensive statistics, the whole subject being so well discussed as to bring the matter fully up to date. In the *Annals of Surgery* for January, 1915, appears an article from Dr. O'Conner, of Buenos Ayres, which besides being very explicit is also quite radical. It is easy to see, moreover, from his article that Dr. O'Conner is a practical artisan, as every operator who undertakes bone surgery should be if he expects to accomplish great results, and leaving all theory aside he applies the same principles of treatment to hidden bone injuries that he would to any other hidden lesion. He outlines as his plan in the treatment of all transverse fractures, in which union is not progressing at the end of thirty days, and in all acute fractures oblique in direction, in which the roentgen ray does not show proper apposition, that he unhesitatingly makes an open operation and applies the Lane plate. This plan of treatment represents a definite technic which I think may well be modified along the following lines: The difficulties

in getting and maintaining good approximation in fractures of the humerus and femur in the shaft, and occasionally in fractures involving the tibia and fibula, place these lesions in a class by themselves. If a simple method of fixation can be provided, I think most surgeons would prefer to treat every fracture in these regions that is not clearly shown in the roentgen ray to be properly opposed by an open operation and adjustment. Without doubt fractures in this region, in which union is not progressing after twenty-five to thirty days, demand prompt exposure of the field and direct treatment. In most of the text-books fully a dozen reasons are given for failure of union, but, as a matter of fact, there are but two frequently occurring causes; one of these is imperfect approximation and fixation and the other the interposition of some soft tissues. The first of these is easily determined by the roentgen ray; the latter rarely discovered by any means until the open operation is made. It is not believed to be worth while in this article to present either arguments or authorities for the views here expressed. The literature is too full of this subject to even justify its representation in a practical discussion. It is the object of the writer to present a simple and safe method of approximation and fixation of these fragments for the consideration of those surgeons who believe the operation is demanded, and not to attempt to make any converts to this step in surgery. Accepting more or less the position taken by Dr. O'Conner, and finding it in accord with the views and practice the writer has for a long time advocated, and as ably presented by the authorities above referred to, he suggests the following plan of practice: In all fractures involving the shaft of the humerus or femur, as well as the tibia, in which the roentgen ray shows the approximation is bad, he advises early operative interference and fixation after a plan to be described. Of course, at any time observa-

tion shows shortening, angulation, with or without failure of union, these steps are to be entertained, and no delay is to be allowed where the roentgen ray shows an unallowable failure of approximation. In the device figured in this article the shaft of the gimlet is made of the same material as the ordinary wood screw. The shaft is from 2½ to 3½ inches in length and 2½ to 3 mm. in diameter. The handle, which is fitted firmly upon the shaft, is more or less malleable, so as to be bent, if necessary, by a pair of strong pliers into adaptable shape. A simple folding clamp, with a set screw, holds the two handles in apposition after their introduction into the bone. It is found that about 3 inches is all that is necessary for the length of these handles. In preparing the patient for operation, which in simple fractures should be delayed two or three days until the acute stage has subsided, ordinary surgical cleaning is all necessary. The field of operation is painted with tincture of iodin, and by a free incision the seat of the fracture exposed. By the use of a suitable pair of forceps, either those specially designed for the purpose of holding the fragments or even the ordinary lion-jawed forceps may be very satisfactorily used, the two ends are brought in apposition after free and liberal removal of all obstructions in the soft parts or bone. In recent fractures, usually while extension is made, the parts can easily be brought together. In old ununited fractures more separation of the soft parts and manipulation is necessary. After the parts have been placed in the position that is designed to fix them, with a small hand drill a hole is made in the bone and the gimlet screwed into it. This opening is made about 1½ inches from the point of fracture. A corresponding hole is made in the other fragment, the other gimlet introduced, and the handles approximated. The depth to which the screw penetrates depends upon the firmness of the hold obtained. Usually it is completely

through the medullary canal, and should involve the opposite side of the shaft. In making the adjustment it is desirable that not even the gloved fingers should be passed into the wound, but that all separation and manipulation should be done by instruments. As the purpose of this operation is to get apposition and fixation of a practical kind, it is not believed wise to "fuss around" too long in making this apposition absolutely accurate, but that if it is relatively so it is better to leave it slightly imperfect than to run the risk of infection by too prolonged manipulation. The callus which will be thrown out around the seat of fracture will soon satisfactorily modify all irregularity, nor should too much manipulation be made with the gimlets after introduction lest the hold in the bone become loosened. Where it seems necessary to put in two pair of clamps after the wound has been exposed a stab wound is made upon one side or the other and the shaft of the gimlet introduced through this, guided by sight through the wound and fixed to its fellow by a similar stab wound in the other fragment. After this fixation the second gimlet is introduced through the open wound and the two are clamped and the bone held as in the specimen illustrated. After the clamps have been placed upon the handles and the adjustment is satisfactory the periostum is closed by catgut sutures. If it seems necessary in any way to fortify the approximation a catgut ligature may be wrapped around the seat of fracture and tied over the shafts of the gimlets in any way indicated. This must, however, be rarely necessary. The muscles are then drawn together and the skin closed well up around the shaft of the gimlet. If there has been much manipulation the wound may be mopped with an iodin solution. Careful hemostasis should be secured and no drainage is required. If it seems advisable the limb is then further secured by a light plaster bandage engaging the joints above and below the point of

fracture. No extension is necessary. A window is cut about the wound so as to permit inspection, and, of course, a careful gauze dressing is wound about the shaft for protection. The gimlets are allowed to remain in place from eighteen to twenty days, according to the choice of the surgeon. Of course if infection should take place, which would only be from some fault in the technic, the foreign body would be removed at once. Though of course infection may follow any carelessly performed operative procedure it is quite well demonstrated that sterile screws can with perfect safety be left projecting through clean dressings for weeks, and it has been my observation that after a few days a scab forms which seals the wound against infection, though the irritation of a foreign body will leave a little moisture. Before the surgical section of the American Medical Association last year Dr. Gerster declared no infection followed weight traction on protruding nails passed through the bones of the leg and left in place for over three weeks with continuous traction made upon them. At the same discussion, Dr. Mann astonished experienced bone surgeons by his report of nails and screws buried in joints. The toleration of the bone for retaining foreign bodies demands the greatest care in technic, but even here it can be secured. Those foreign bodies which are to be removed, however, are particularly free from troublesome symptoms if used with ordinary precaution. I have used the instruments as described in eight cases, which are reported below, with perfectly satisfactory results in all, and with infection but once, and in this case where infection occurred, though an acute fracture of the thigh, firm union took place with a good function. Dr. O'Conner declares the screws in the Lane plate if properly introduced do not become loosened. In my cases the shafts of the gimlets were firm and aseptic when removed after fifteen to twenty days. The advantages of

this method of fixation over the Parkhill clamp are that it is very much simpler and easier of application and far less cumbersome, and while perhaps the approximation of the fragments is not always quite so accurate as can be obtained by the four shafts in the Parkhill clamp, the practical results are in every way satisfactory. Its great advantage over the Lane plate is that there is no foreign body left to give trouble afterward, and that inasmuch as an accurate fixation maintained for seven or eight days will insure satisfactory union in nearly any healthy individual it is easy to remove the clamps at any time after the end of two weeks if there is any occasion for it. The fixation is far more firm than can be obtained by the wire or other suture. This gimlet resembles remotely the instrument of Dr. Allen, of Indianapolis, but its application is altogether different.

A report of the cases follows:

Case 1.—White male, aged twenty-four years. Roentgen ray showed an oblique fracture of the left tibia, with considerable displacement, ununited after nine weeks in plaster. This fracture had been plated at the time of the accident, but because of suppuration plate was removed on the tenth day and plaster employed. After well curetting the ends of the fragments, apposition was readily accomplished and the gimlets introduced as outlined above. A heavy flannel bandage was used to protect the skin and plaster bandages were carried from the toes to well fix the knee. A window was left where the plaster wound around over the shafts and gauze dressings at the wounds. These dressings were so applied as to be easily renewed when soiled. There was little pain complained of, and the dressings were only slightly stained, requiring change only on the second day. A dry scab formed about the shafts, but there was not even serum after the first few days. The gimlets were removed on the sixteenth day;

reverse turning easily released the shafts after the clamp was loosened. The shafts were firmly fixed in the bone, there having been no necrosis. After examination the wound was dressed and the plaster was not changed, as fixation was satisfactory. At four weeks the plaster was removed and union found to be firm; plaster reapplied, and when finally removed at the eighth week firm union was found.

Case 2.—White male, aged twenty-one years. Fracture involving both bones of the middle forearm. In plaster six weeks. The ends of the fragments were freshened by the bone curette; the radius only was engaged by the clamps. After fixation the skin was protected by a flannel bandage and a plaster cast applied over this about the gauze dressings at the wound site. The result at five weeks was good union.

Case 3.—This was a colored male, aged twenty-one years, with a wire still in the radius, after a repair of a break almost exactly the counterpart of Case 2. After removal of the wire the same plan was employed, with good union as a result.

Case 4.—White male, aged twenty-five years. Sustained a fracture of both femora in an automobile accident; in right femur, supracondyloid fracture; in the left, fracture of the shaft about the middle third. The original dressing was extension with long lateral splint and sandbags for the left leg (double inclined plane for supracondyloid break). After a week the roentgen ray showed marked overlapping of an oblique fracture in the left shaft, with 1½-inch shortening. After exposure much effort was required to get satisfactory position, when fixation was easily maintained by the gimlet screws. There was considerable oozing in this case, but no shock and no exceptional pain. A full-sized window was left at the site. Some pus appeared around the upper gimlet shaft

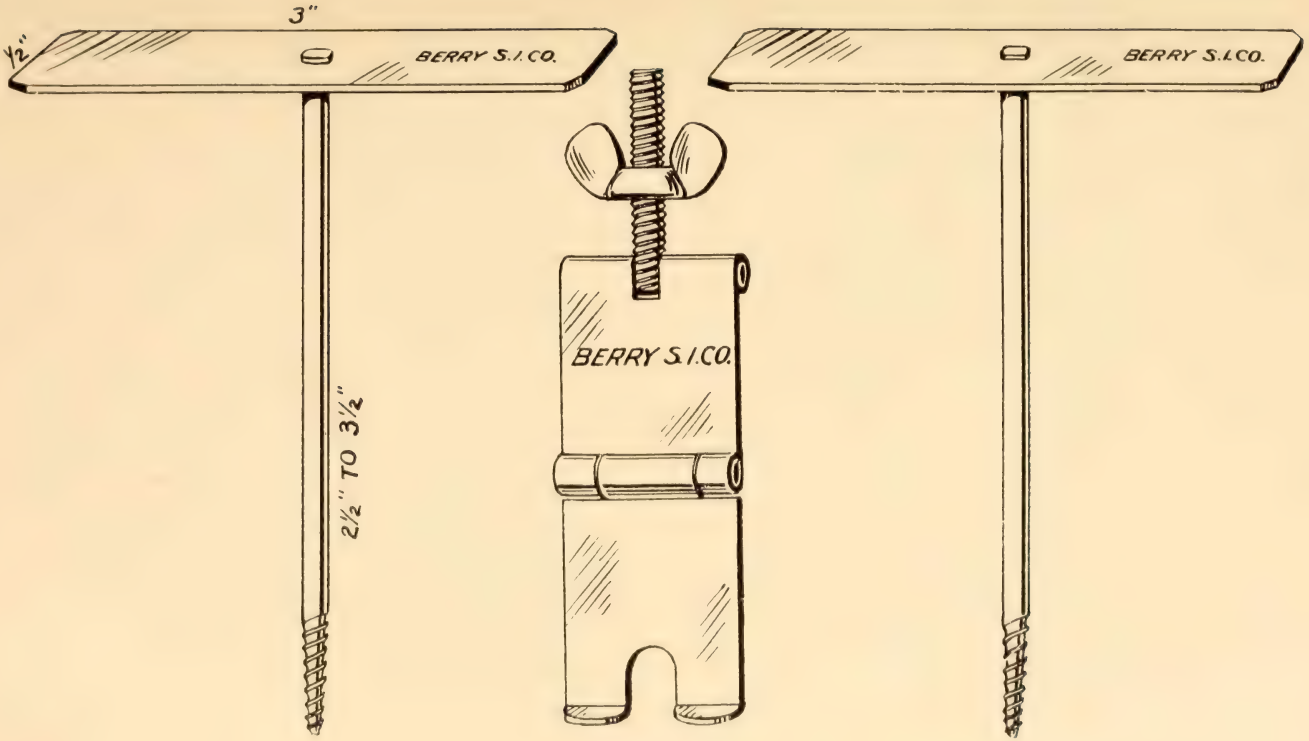

Fig. 1. The device.

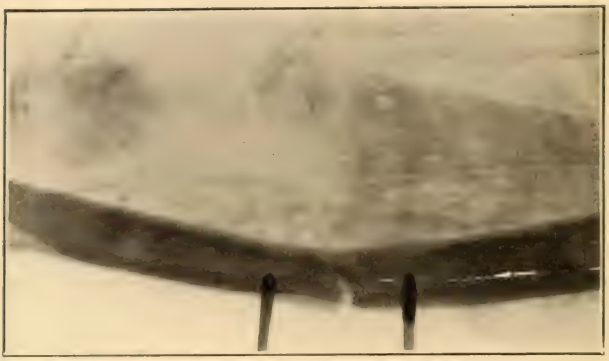

Fig. 2.—X-ray photograph of femur in Case 7 at about twentieth day.

Fig. 3.—X-ray photograph of humerus in Case 7 at twentieth day.

on the fifth day, and there was a discharge of serum and pus in moderate amount for a week or more, but no constitutional symptoms of any importance. The gimlet was taken out on the eighth day while the plaster cast was left in position. The cast was replaced at the fifth week, and when finally left off at the eleventh week, firm union was found. Notwithstanding a double fracture he now walks with barely a limp.

Case 5.—Colored male, aged twenty-six years. Old united fracture of upper third of right humerus. Dressed outside the hospital at the time of the accident with plaster cast; six weeks previous to admission roentgen ray showed an oblique fracture, ends overlapping, fibrous union only. The ends were dissected free and easily approximated. In this case the oblique shape of the break made it convenient to pass one of the gimlets through the tip of one of the fragments so as to practically nail the two surfaces together. The other treatment and dressing were the same as outlined in the other cases. The gimlets were removed on the sixteenth day, at which time a new plaster cast was applied, which was left in place for four weeks. Firm union resulted.

Case 6.—White male, aged nineteen years. Ununited fracture of the left humerus. Three months after the fracture, no union resulting, the ends had been freshened and chromic catgut used for fixation (just how applied was not clear). On exposure at the operation five weeks later the ends were found overlapping, the fracture was almost transverse, but there was quite a faulty angle and much adventitious tissue. With a sharp-pointed scissors the fragments were freed and the ends scraped, the gimlets introduced, and the usual dressing applied. Good union followed.

Case 7.—The illustrations apply to this case. White boy, aged eleven years. Sustained a fracture of the right

fibula, right femur and right humerus in upper third of shaft. Three weeks later union was found at the ankle break, but the roentgen ray showed angularity and overlapping at the other sites, with free movement. Both fractures were approximated as shown in the illustration. Accurate care was not observed when the plaster was applied to abduct the thigh, and there is shown a curve in femur so common after these fractures. No persistent effort was made to get absolute accuracy in the humerus, but the arm now shows a smooth point of union. The gimlets were introduced and the dressings applied as in the usual manner; no extension was made. The boy had no shock and but little pain. After thirty-six hours he was comfortable throughout his convalescence. The gimlets remained dry, and when they were removed on the nineteenth day were found tightly grasped in the bone. At this dressing the plaster was changed upon both limbs and an effort was made to correct the curve in the thigh, which was still flexible. Union in the humerus was perfect. Plaster was reapplied to both arm and leg. From the humerus it was removed at the fifth week and the femur at the eighth week, when a perfect functional result was found in both.

The writer believes the following conclusions to represent a sound surgical basis:

1. The advantage of directing the adjustment and fixation of the fragments in most fractures of the thigh and humeral shaft, as well as many of the tibia and other long bones under the eye is so positive as to need only a safe and simple method for general adoption.

2. Badly apposed as well as ununited fractures of the long bones, conditions easily recognized by modern methods demand undelayed treatment by the open method.

3. As fixation by absorbable ligatures requires as much or more manipulation as the putting in of the plates; the

risk of infection is hardly compensated for in view of the insecurity; wiring of the fragments accomplishes poor fixation with the drawback of the retained foreign body.

4. Lane plate in skilled hands accomplishes perhaps the best fixation, but carries the serious objection to the inexperienced of infection, and even where all seems to go well, later removal is often required.

5. If by a simple inexpensive and safe method of fixation, not even involving the broken surfaces, approximation can be maintained it should become the ideal method.

The instrument figured here consists of two gimlets each made in two sizes, the shafts of which are respectively 2½ and 3½ inches long and 2½ and 3 mm. in diameter. The shaft is of uniform size, terminating in a slightly tapered screw end about ¾ inch in length. This shaft is made of an ordinary clothes hook straightened out. This shaft is firmly fitted to a flat handle about 3 inches in length, ½ inch in width, and 1/20 inch thick, made of German silver. The clamp, made of the same material, consists of a hinge 1¼ inches in length, ¾ inch broad, and 1/16 inch thick, closed with a brass set screw.

These gimlets are kept in stock by the Berry Surgical Instrument Company, Louisville, Ky.

DISCUSSION ON THE PAPERS OF DRS. VAUGHAN AND GRANT

Dr. W. P. Carr, Washington, D. C.—This is a subject on which I have pretty strong convictions, and I cannot let these papers go without a word of protest: (1) against the recommendation for operating so freely and, (2) against the idea of fixing the femur, in alignment by the means of screws, plates, bands, etc. I believe there are very few fractures of the femur that require open operation. If one understands the use of good extension (I will not say Buck's extension because that does not apply to all cases; but some form of extension), or knows how to apply a plaster cast, with a proper fracture table, and the leg in the proper position, it will seldom

be necessary to operate. It may be necessary in a fracture of the femur involving the knee joint when a short fragment cannot otherwise be kept in place, or sometimes when a short fragment is broken off at the upper end, it may be well to adopt the method of putting in a screw as described by Dr. Vaughan.

It is seldom necessary to subject a patient to the risk, and there is a risk in operating. A risk not only of infection, but of delayed union, non-union, crippling adhesions, and where foreign bodies are used to fasten the bones there is risk of infection occurring years later. The bad results following operation are not all due to infection. I have had to take out Lane plates two years after they were put on, because they had become loosened, and painful without apparent infection.

In fracture of the upper end of the femur, the upper fragment tilts upward and outward. The thigh should be adducted, flexed to relax the psoas and iliacus muscles, and the knee flexed. Then with good strong traction, with any good fracture table, and the cast can be applied with traction still on, and with good counter extension against the body and extension against the flexed leg, the bone cannot move.

Personally, I cannot understand the mechanical mind of a man who says he cannot wire a femur satisfactorily. Why he should use a thick piece of metal when a small loop of wire will do as well, if put in properly. I think that the reaching out for these peculiar devices and screws and bands is due to the fact that one does not understand the simple mechanics of wiring bone properly.

Dr. A. A. Law, Minneapolis, Minnesota.—With your proverbial southern hospitality, you have extended to us the privilege of the floor; therefore I am grateful for an opportunity to say a few words on these two most excellent papers.

I have noticed that when a paper is read on appendicitis or on fractures, it is always productive of a lot of discussion, because these are the things every doctor has to contend with.

Inasmuch as I am privileged to belong to a University Clinic, I am loath to let these two splendid papers pass without further discussion. At the risk of appearing tedious, I wish to emphasize again a method of treatment for hip-joint fractures which originated in the west, and which is rather extensively used there I do not heat this method of treatment even mentioned in the eastern clinics; I refer to the method of treatment devised by Maxwell and Ruth which is particularly applicable to old people.

It consists of a system of double extension by means of the regular Buck's extension on the leg and further extension laterally, applied to the thigh at an oblique angle with a wide band around the thigh.

In a robust individual, the Buck's extension carries a pull of thirty pounds and the oblique extension half of that; the sum of both extensions is exerted in a direction parallel to the long axis of the neck of the femur where it is needed.

We have had twenty-eight cases in old people treated by this method, with but one failure. One woman, aged eighty-seven years, and they all, with one exception, got primary union. I believe this treatment of fractures in old people should merit your consideration as it is so simple in its application.

These old people can be propped up in bed while under treatment so the danger of hypostatic pneumonia is almost nil—we did not note it in any of the cases.

I wish to emphasize the use of the so-called Steinman pin, or better perhaps the Ransohoff tongs, for treating certain fractures of the femur or of the lower end of the tibia. Without the use of these agents in some cases, we would be obliged to resort to more radical methods of open treatment. Particularly in supracondyloid fractures of the femur where the pull of the gastrocnemius muscle is such that it is impossible to keep the lower condylar fragment reduced without some such device.

In the use of the Steinman pin we have had no infection, and there should be none if it is properly exhibited. With the tongs of Ransohoff we have, as well, had no infections.

Sir Arbuthnot Lane emphasizes the fact that the Lane plate should never be used in compound fractures. The experience of surgeons down in the Panama Canal zone, and of others in the great steel districts has shown that in certain isolated instances the Lane plate can be put on in cases of compound fracture and after it has accomplished its purpose, can be taken out later on, if necessary.

As to the use of autogenous bone graft in the presence of chronic infection, we have done much experimental work on lower animals where we have deliberately infected the wounds from other old infected wounds, and in every instance the autogenous bone graft has survived. We have had the temerity to use them in twelve instances in the human being and in every instance the bone graft has survived in part or in toto, and union has resulted. I thank you.

Dr. Alexius McGlannan, Baltimore, Maryland.—Last year I talked to you about fractures of the neck of the femur. Our series of cases now reaches 61. The important point in the treatment of fracture of the neck of the femur is to reduce the fracture whenever a patient will stand any vigorous treatment. This point has been brought out by Whitman, but is frequently neglected. The manner in which we fix the limb is a matter of relative indifference because the bad results in the treatment of fracture of the neck of the femur are due to the fact that the fracture has not been reduced. It can be reduced by abduction, traction and inward rotation. It is very essential to bring about reduction in these cases, because it has been shown that the bad results in many cases are not due to non-union, but due to faulty reduction. The deformity which ensues is graver, and more crippling than non-union in a case of fracture of the neck of the femur. Abduction, even with imperfect apposition, has given a leg upon which the patient can walk without apparatus.

For old people the Maxwell-Ruth method or some modification of it is especially valuable. We place the patient on the bed in such a way that the thigh is flexed about one-half and the knee flexed on the thigh and a board spreader is tied to the side of the bed, the bed elevated, allowing the trunk to pull away from the fixed knee. We believe this is the best way of handling these fractures in patients who will not stand an accurate and immediate reduction of the fracture.

The ice tongs of Ransohoff is a valuable device in all fractures of the femur. It is, of course, simply a modification of the Steinman pin. Looking at the illustrations of the Steinman pin and the apparatus which is fixed to the pin, the ice tongs is suggested to one's mind, after the tongs have been called to our attention by Dr. Ransohoff. A point in the treatment of all these fractures is that they must be fixed in flexion. If we flex the thigh on the abdomen and the leg on the thigh we find reduction is much easier, and if we can fix fractures in this position, patients are more comfortable.

I think this Association certainly should not go on record as stating that the open treatment of fractures, particularly recent fractures, is a simple operation. It is one of the most serious operations we are called upon to do.

Another point is the relation of function to anatomical replacement. All of us know how frequently we have good

function with relatively poor anatomical fixation. Anatomical fixation is not the most important part of the treatment of a fracture. If by a certain method of handling cases of fracture we get a good functional result, that is more important for the patient.

Dr. James M. Mason, Birmingham, Ala.—I consider that the treatment of fractures of the femur is about the biggest problem in general surgery. There is, especially in the aged, quite a percentage of mortality, If a bad result is obtained the usefulness and comfort of the patient are so interfered with, that he is handicapped for the rest of his life.

There are some points concerning certain fractures of the femur to which I would direct your attention:

With the help of the fluoroscopic table, we have been able in recent years to handle transverse and serrated fractures of the femoral shaft much more intelligently than was formerly possible. Under the fluoroscope, with direct observation, we may, when the patient is deeply anesthetized, reduce these cases and are able to tell when we have the ends directly opposed, or the serrations definitely interlocked.

When such apposition or interlocking is secured we may at once inclose the fracture in plaster, with the assurance that there will be no shortening, for the very apposition of the ends prevents this. When the plaster has hardened, a picture may be obtained and other radiographs may be secured from time to time to assure us that there has been no slipping after the adjustment of the fracture. Of course if the plaster is not applied firmly, or if the limb is moved before it has firmly set the fragments may become displaced, but such an accident is very unlikely to happen, and we are reasonably sure of securing a good result without any shortening.

The oblique fracture must be treated differently, but I will not go into that.

The next point concerns the intracapsular fracture of the neck. We observe this particularly in elderly persons.

I have long since outgrown my fear of a reasonable confinement to bed of patients suffering from this injury, and believe that such patients are safer and more comfortable if properly treated in bed than if an attempt is made to put them up in some sort of an ambulatory apparatus. Prolonged confinement, especially in plaster is to be condemned in old persons. The

Hodgen splint, I believe, offers ideal conditions for handling such cases. With this splint properly adjusted, the leg may be flexed on the thigh and the thigh on the abdomen. Extension may be secured, and, by turning the feet of the bed away from the direct line of traction, may be secured to any desired degree. Together with these advantages, the patient may be easily turned from side to side, may be propped up, and may be more easily kept clean and free from bed-sores. I am pleased to note that Estes advocates this method of handling these fractures, and calls particular attention to the above method of securing abduction. With this wide range of motion in bed, the elderly patient is at great advantage over the one who is subjected to the absolute fixation of a plaster cast.

Dr. E. Denegre Martin, New Orleans, Louisiana.—I am very much afraid that many of us are giving up old and good methods because we want to be progressive. Dr. Mason struck the keynote in calling our attention to what has been in our hands one of the most valuable adjuncts in the treatment of fracture of the thigh in old people, and that is the Hodgin's splint. I think I can easily count fifty cases to date treated very satisfactorily with this splint. You have in it all the combined methods. Extension and traction when it is properly applied. Patients are made comfortable with it. They can sit up in bed, assume any position, and I can assure you that I have never had better results by any other method, especially in old people with fractures of the neck of the femur. I recall three cases in women over sixty-five years of age who are walking around with a slight limp, and they were made comfortable from the time they met with the accident.

I believe it is a mistake to operate on an old person in many instances. We are forced to operate sometimes because the *x*-ray reveals deformity, and juries do not know the difference between disability and deformity. They will give a man more for a deformed leg than one who has a straight leg with disability. We see men every day who are operating on fractures —men who could not build a chicken coop, to say nothing about tackling a delicate and intricate task like the one under consideration. It means that every beginner should try to reduce a fracture properly. Did you ever sweat blood over the reduction of a fracture that has been standing two or three weeks? I have. I have been more successful in recent years because I

have learned how to reduce fractures successfully. The mistake I used to make in the beginning was too much denuding. I expose the seat of fracture, and where it was an oblique fracture I use a band or a plate. In the past most of us have inflicted a large amount of unnecessary trauma in dealing with fractures, and many of our bad results have come from improper reduction of the fragments. If we can put the fragments in apposition and hold them there, we will get results. Our bad results come from necrosis of tissue, and you will find in opening the wound you will often have a serous discharge that is not infective. So we are forced today to operate, but what we want to do is to adopt that method which will give us satisfactory results with the least trauma.

Dr. Vaughan (closing on his part).—I have always been envious of the man who is able to reduce all or nearly all fractures by extension and get good results, and the man who can do this has supernatural ability. I am certainly not able to do it. I think a good many of these fractures, I would not say the majority, but certainly a very respectable minority, require operation to get good results.

As to extension by means of adhesive plaster and weights (Buck's extension), I remember one case in particular of fracture of the femur in a very stout man, with strong muscles. I studied his case very carefully anatomically and surgically. I put him in a position to relax his muscles, with the thigh flexed on the pelvis with double inclined plane and adhesive plaster, with sixty pounds of weight, which was as much as we could attach to him and feel safe. In spite of that he got well with one inch of overlapping. We could not tire out the muscles. I believe there are muscles you cannot tire out by any amount of weight you can safely use.

As to the Steinman-Codovilla method, I might call it the Steinman-Codovilla-Ransohoff method, while I have very great respect for these gentlemen, I have not used the method. I do not see wherein this method of extension is an improvement over those less dangerous.

As to the Maxwell-Ruth method, I tried that long ago and gave it up. I think it is a good method, but it impressed me as cumbersome in treating a fracture of the neck of the femur. I think the Whitman method, with extreme abduction, and the use of plaster of Paris will hold the bone in position usually.

The *x*-ray must be used afterward to be sure it is in position. With the Maxwell-Ruth method you cannot well use the *x*-ray. Some gentlemen seem to think it is an easy matter to reduce a fracture of the neck of the femur, and then allow the patient to sit up and move around without displacement. The upper end is very short in this fracture, while the lower end is very long; therefore, the leverage is great, and if you permit motions like that, they are not likely to stay in place. So in order to maintain a fracture of the neck of the femur in position, unless well impacted, you must fix the pelvis by some method.

I have not heard anything said about the interlocking of the fragments. That is the one method I thought there might be something new about. I am not sure but that some one may have used it as many men have the same thought independently of one another.

One gentleman said we can get good results without necessarily having anatomical perfection; that is true. If you interlock the bones, the bone is not perfectly straight in all of its planes, but the result is good. That is one of the main points to which I desired to invite your attention.

Dr. Grant (closing).—I only want to say a word or two more in emphasis of the point I made in connection with the presentation of this instrument, and that is, it is my idea that it is a good plan to see what you are doing. If one is afraid to make an incision in the body for the purpose of seeing what is there and what is best to do to remove the pathology, he is hardly fit to be a surgeon. For my part I believe such lesions as can be corrected under the eye can be safely exposed in nearly all fractures and in order to do so satisfactorily, after they are exposed, the simplest method of fixation should be employed to hold them until nature has adjusted them. My experience with the gimlets is that they will hold the bones firmly in the position they are placed with perfect safety. I am sure no infection will pass along the shafts into the bone if the skin is rendered thoroughly aseptic, beforehand. The gimlets can be taken out at the end of two or three weeks if there is an apparently satisfactory beginning union. They are adaptable not only to recent fractures but to ununited fractures, and the purpose is better accomplished by an instrument that can be removed than by one that remains in place. They are far safer in compound fractures than permanent plates. More perfect apposition can be maintained by a

plate that has a screw on the bone than with an instrument that straddles over it, but what we want is a good functional result with satisfactory anatomical position with as little rest as possible. My experience has taught me that there can be very little or no objection to the use of these gimlets. They can be easily applied in fifteen minutes to nearly any fracture. If four of them are used, no plaster is necessary. If advisable to put on plaster, it can be done. When it comes time to take the gimlets out the clamp is loosened, it is then simple to unscrew the gimlets and remove them.

My observation and experience in the employment of an instrument of this kind would lead me to say that there is little danger of infection, as a rule, and the mechanical effect of the apparatus is satisfactory.

THE PATHOLOGICAL UTERUS AT THE MENOPAUSE

By Charles R. Robins, M.D.
Richmond, Va.

In looking over a series of cases recently in which I performed the operation of hysterectomy, I find that 58 occurred in women who were forty years old and over, and in all of these the complete removal of the uterus and adnexa had been practised. In 28 of these the operation was performed for fibroids, pelvic inflammation, and other conditions in which the impossibility of conserving the organs was manifest and beyond dispute. In the remaining 30 cancer was either a positive or a possible diagnosis. In 4 a positive diagnosis of cancer of the cervix, afterward confirmed by the microscope, was made, and a Wertheim operation, preceded by cauterization with the Percy cautery, was done. In 26 a diagnosis of chronic metritis, including in this induration of the cervix, was made and a possibility of malignancy considered. In practically all of these bleeding from the uterus was a prominent symptom manifesting itself as irregular or continuous bleeding and sometimes accompanied by marked anemia. In 2 cancer of the fundus was found on opening up the uterus.

In attempting to arrive at the diagnosis of cancer of the uterus we are often met with great difficulties when the case is in its incipiency, and therefore presenting the best hope from an operation. In advanced cases with

marked symptomatology and gross pathological involvement the question of diagnosis does not present itself, it is obvious, and with these cases we are not concerned at this time. Usually when the cancer is situated on the vaginal aspect of the cervix it can be diagnosed in its earliest stages by physical examination, but in cases originating in the cervical canal or the fundus an early diagnosis without the microscope must remain a conjecture.

If we consider the symptomatology associated with cancer which we could reasonably look upon as danger signals, we are painfully impressed with their uncertainty and irregularity. The most commonly accepted and most reliable is an atypical bleeding. This may manifest itself as a slight show following some form of trauma, as coition or straining at stool, or as a bleeding between periods, or excessive bleeding at periods, or a bleeding returning after the menopause. The principal point in all of these is the development of a bleeding which has not previously existed and which does not present an obvious etiology. However, we can all recall cases, particularly those of adeno-carcinoma, originating in the cervical canal in which the most careful questioning failed to elicit a history of any type of bleeding in the early stages of the disease, and the first symptoms were those of pain from extension of the disease into the parametrial tissues. Still further uncertainty is produced by the fact that such symptoms may be occasioned by other conditions than cancer, particularly hyperplastic endometritis, which frequently springs up about the time of the menopause and the development of a small fibroid polypus in the fundus. The indurated and enlarged cervix of chronic cervicitis also is quite difficult to diagnose from the induration and reaction present in cancer of the cervical canal. In addition to this it is now being generally admitted that any pathology of the cervix or fundus may be regarded as a precancerous condition, and that the

transition into malignancy may be so insidious as to present no special symptomatology until carcinoma is well advanced. In fibroids, for instance, we may have malignancy ingrafted when examination may show only the benign condition which apparently fully accounts for the symptomatology present. It would thus appear, and is generally conceded, that unless the growth comes under the eye or direct touch that it is practically impossible to accurately diagnose a beginning malignant condition, and even then a microscopic examination may be necessary.

For the purpose of securing tissue for microscopic examination, we have recourse to two methods: (1) curettement when the growth is suspected in the body of the uterus, and (2) excision of a portion of the cervix when it is suspected. Both of these are open to serious objections. A curettement must be complete in order to be conclusive, and unfortunately it is often not as complete as we think it is, so that it is impossible to secure a negative report even when the cancer is present. Excision of a portion of the cervix is open to the same objection, so that we might not get just exactly the tissue that is involved. Again, in both of these cases if satisfactory work is done, anesthesia is necessary, which unless frozen section is used means a second anesthesia. But above all I am convinced that cutting into cancer at all is bad technic, and undoubtedly causes invasion of sound tissue by cancer cells. This is particularly true if an appreciable time elapses before the final operation is done. This is obviated to some extent by the use of frozen section, with immediate operation, but even then I believe that it is dangerous. How many minutes or how many days it takes for these cells to invade we have no means of ascertaining.

It has been suggested that in view of the uncertainties of diagnosis by means of curettement and excision of tissue that the cervix should be amputated and the uterus opened

through an abdominal opening for complete examination and inspection. While this would make the diagnosis much more exact it would amount to a preliminary operation, and when it is to be followed by a total hysterectomy it would certainly add an appreciable risk. In the same length of time the uterus could be removed.

Taking all of these things into consideration I have come to the following conclusions, and have made them my basis of practice for some years:

1. In cases favorable for cure from operation it is not always possible to make an exact diagnosis.

2. In our efforts to make our diagnosis exact we are liable to lose the advantage of an early operation by our efforts to secure tissue for examination, in this way disseminating cells and stimulating vicious growth.

3. That a pathological uterus is potentially a malignant one, and that even if cancer is not already present it may develop later.

I therefore believe that the line of safety requires that in those cases occurring in women about the menopause or after when the symptoms and physical findings would suggest the possibility of malignancy, that our procedure should be a total extirpation of the pelvic organs and the pathological investigation made after the organs have been removed. In 26 such cases cancer was found in 2, or slightly less than 8 per cent.

These conclusions are based on the consideration of malignancy alone, but there are other very excellent reasons for removing such uteri. In the first place they are pathological and have produced enough symptomatology to cause the patient to consult the physician. The pathology has usually existed for a long period of time, and the alterations have become so permanent that conservative measures are liable to be disappointing in results.

The organs have fulfilled their usefulness, and under

normal conditions would be obliterated by nature. We are therefore simply acting in the line of nature when a removal is practised.

Our efforts to conserve often require multiple and time-consuming operations, and the net results of our efforts are to save something that the patient is better off without.

In certain types of bleeding uteri conservative measures do not relieve. I have had cases of hyperplastic endometritis that have persisted over periods of years and which have been curetted repeatedly with only the most temporary relief, the hyperplasia returning promptly after each curettement. In other cases in which the bleeding has been sufficient to keep the hemoglobin under fifty for long periods, examination of the uterus has shown no pathology of the mucous membrane or any tumor formation or any other change in the uterus other than slight increase in size and thickening of the wall. I have not found that curettement is of much benefit in relieving the excessive bleeding that so often occurs about the menopause.

When we encounter a pathological uterus at the time of the menopause the first question should be, "Why save the uterus?" The burden of proof is to show why it should be saved. My own opinion is that when such cases present themselves and the symptomatology is completely accounted for by an obvious pathology which can be easily corrected that this is all that is necessary. On the other hand, when the pathology is gross, particularly when the uterus is enlarged or the cervix indurated, or both, and especially when irregular bleeding or debilitating hemorrhage is present, that the most conservative treatment, as far as the present and future welfare of the patient is concerned, is total ablation of the pelvic organs.

In this connection we have to consider two points, mortality, and effect of operation on patient. In reference to mortality I have found the radical operation safer than

a series of conservative operations. The group of cases considered in this paper is too small to base mortality statistics, but there were no deaths.

As to the after-effects on the patients I have been able to observe no bad results. We have to remember that nature is about to obliterate these organs and their function is over, and in addition they have been the source of impaired health for a more or less prolonged period. My experience has been that the patients improve in health and strength and pass from a state of semi-invalidism, with a tendency to introspection and pessimism, to a cheerful, happy existence in which they are able to take their share in the various activities of life.

In order to secure good results after hysterectomy, however, the technic must be clean and devoid of trauma and the parts left properly supported by attachment of ligaments. While the operation can be quickly done, technic should not be sacrificed to time, and often small details have an immense effect on the future welfare and usefulness of the patient.

I believe then that we may fairly conclude the following:

1. Total abdominal hysterectomy is the operation of election in the pathological uterus at the menopause.

2. In an appreciable number of such cases, cancer will have been found to have already developed.

3. The adoption of radical methods in dealing with such cases offers the surest protection to women from cancer.

DISCUSSION

Dr. Reuben Peterson, Ann Arbor, Michigan.—It seems to me that Dr. Robins' paper is something radical. While it is true that we feel more free to remove the uterus at the time of or after the menopause because it has ceased or is about to cease to functionate, I think we should hesitate to remove it as a rule except for pathological reasons or upon well founded clinical

grounds. For it must not be forgotten that women at the menopause have distinct enhancement of the nervous symptoms from the hysterectomy and no one who has seen women suffer from such symptoms will want to subject them needlessly to this very annoying train of symptoms.

Some years ago I tried a number of ways of treating the ovaries where hysterectomy was necessary and published my results. It was found that while one or both ovaries left after the removal of the uterus did lessen the menopausal symptoms in a certain proportion of the cases, in most cases the women still suffered from the nervous symptoms peculiar to the menopause.

I believe that practically we do not increase the danger very much in the case of cancer from a preliminary curettage and that it is a very valuable diagnostic procedure especially at the time of the menopause.

It must not be forgotten that women at the time of the menopause often dread to lose their uteri for marital reasons. Every woman knows she must cease to menstruate and go through the menopause at some time in her life but she shrinks from the artificial menopause because she fears her husband will look upon her differently, from the sexual standpoint. Of course if it be necessary to sacrifice the uterus for pathological reasons, the patient will want it done at the menopause as well as at any other period of her life. Just because the uterus can be removed with hardly any risk to life does not mean we should advocate its removal except upon well defined conditions.

Dr. Herman J. Boldt, New York City.—I was much interested in Dr. Robins paper and in the method of treatment advocated. It is that particular class of patients in whom you make curettement after curettement, and in the course of a short time these patients begin to bleed again. The curetting does not cure them. In that class I am sure permanent relief can be afforded by chlorid of zinc or radium. I believe that those who have radium at their disposal will be perhaps more satisfied with it; but I am positive that chlorid of zinc will cure nineteen-twentieths of that class of patients, and that is the class of patients to whom I alluded when I said: I did not feel like subjecting them to a major operation as long as there was no neoplasm in the uterus.

With regard to curetting in cases of carcinoma of the corporal endometrium, I have had a fairly large experience, and I have

yet to see the first instance where I have reason to believe that preliminary curetting and the examination of the scrapings did any harm or quickened the dissemination of the disease, because in all instances where a diagnosis of carcinoma was made from the laboratory findings we operated very soon.

Dr. Charles L. Bonifield, Cincinnati, Ohio.—In answer to Dr. Blair's question about the psychic effect of removal of the uterus, for a good many years I have taken the trouble to ask patients' husbands and to observe patients who have had hysterectomy, and there are three things to be considered about it. (1) the influence on the husband; (2) the influence on the marital relation of the woman herself, and (3) the effect of inducing the menopause, bringing it on precipitously.

My observation has been that if the husband did not know the uterus was gone, he would never find it out through any sexual relations with his wife, because if a woman has been married a number of years she will not lose her sexual appetite or means of gratifying him. In fact, we all know that many women exhibit more sexual appetite at the time of the menopause than they did before.

In regard to the third point, it has been my observation that the menopause, as Dr. Peterson has said, is more tempestuous, but it runs a more rapid course. They get through with it quicker. It is not spread out over a number of years.

There is one other point I wish to mention, and that is, in many of these cases, where we find curetting will not do good, there is real disease of the ovaries, and that is one of the objections to treating these conditions by radium or by chlorid of zinc or *x*-ray. There is a real pathological condition of the ovary that is keeping up trouble, and the patient is not going to be well until the ovaries are removed.

Dr. Robins (closing).—In reference to psychic changes following hysterectomy, my experience has been—and I think it is very well borne out by the number of cases I have had—that the psychic element is unimportant after hysterectomy for a pathologic uterus. There is quite a difference between taking out a uterus that has not given trouble and taking out one that has. I am pretty positive of that, and some time in the future I propose to get together all the cases in which I have done hysterectomy and make some inquiries to find out that point. I believe that is an important point regarding a uterus that has given a great deal of trouble and is present at the time

of the menopause. We are not talking about young women in this paper. So far from having a bad psychic effect, it rather improves them. I was surprised to notice this in the first hysterectomies I did, and I have observed it so frequently since that I think it is a fact. I would like to make another remark in that connection, and that is in reference to leaving in ovaries for the supposed effect it has on such patients. That was also brought out by Dr. Peterson. My idea is simply this: it is not the ovary at all that we are concerned with, it is the menstrual cycle; and the loss of blood is just as essential in preserving the equilibrium of a woman as is the presence of the ovary or ovaries. In addition to that, if we have an ovary that is unrelieved by the periodic discharge of blood, I believe it excites more nervous trouble than if a total and complete operation is made. It is somewhat on the same plan as was mentioned about treating thyroids earlier in this meeting. We sometimes get better results when we break the vicious circle completely. My observation has been that if I remove the whole business I get less psychic disturbance than where I leave a part of it.

In reference to curettage which has been referred to, that is a thing we are all taught to do and what I have believed was the proper thing to do. I have never had the experience of a cancer coming back or becoming more virulent after the curettage; that is, cancer of the fundus, but I have had some painful experiences with cancer of the cervix. I remember one case where the growth on the cervix was so small that I could not make up my mind whether it was cancer or not. I therefore excised the growth and had it subjected to microscopic examination. I received my report in a week or ten days. At that time we did not have the frozen sections such as we have at the present time. Now, we have a laboratory adjoining our operating room, where we can have the tissue examined immediately by frozen section. At the end of a week or ten days, when I received my report, and started to operate on the patient, I found the growth had already returned. Of course, it must have been rather virulent. I cauterized the growth and did a Wertheim operation. It was ordinarily what you would call a favorable case; it had started right on the surface, and it could be thoroughly cauterized. She had a recurrence of the cancer. It was a case where I felt under ordinary conditions if I had not made a resection for the purpose of diagnosis, the patient might not have had any further trouble, so that I have for some years felt

great hesitation in making curettements and excision. With the frozen section method that is reduced to a minimum. If we find cancer we can cauterize immediately.

Just a remark about what Dr. Bonifield said about husbands not knowing whether the uterus was taken out or not, or that they need not know anything about it. As long as you leave a good vaginia, that is all he cares to know about anyhow.

With reference to the remarks made by Dr. Elbrecht, I would like to say that I have had a good deal of success in treating certain types of bleeding from the uterus in young women by the administration of thyroid extract. I have been inclined to believe that there was some sort of relationship between the thyroid gland and menstruation. I do not know whether that is a fact or not, or whether I dreamed it. But I have had cases of bleeding from the uterus that were not relieved by curettements and other things, but which were cured by the administration of thyroid extract. I made that remark to Dr. Wilson of the Mayo Clinic and he seemed to think I dreamed it, but I can produce a few cases.

ARTHROPLASTY WITH THE AID OF ANIMAL MEMBRANE

By William S. Baer, M.D.
Baltimore, Md.

The question of the production of mobility in ankylosed joints is one which is and has been occupying the attention of the surgical world for a number of years. The advance in surgical knowledge since Lister's great discoveries and the deductions we have been able to draw from them have made the past ten years the psychological time for the most earnest consideration of this subject and for the solution at least of part of the problem. Not many years ago the entire aim of surgeons, as well as of orthopedic surgeons, was the eradication of disease in an affected joint. Little attention was paid to the restoration of its normal physiological action so long as the pathological condition was overcome. With the inauguration of asepsis and the knowledge gained from it by the numerous operative measures on diseased articulations, with our everincreasing researches and investigations in bone and joint pathology, and with the stupendous volume of information which the discovery of the roentgen rays has revealed to us, the surgeon to-day may no longer rest his case with the elimination of the disease process, but in his treatment of the acute trouble or subsequent to it he must aim to restore the joint to its anatomical condition, requiring it to perform its physiological function in a perfectly normal manner.

Methods for Producing Mobility. The production of mobility in ankylosed joints has been approached by

various methods, and they have met with various degrees of success according to the anatomical formation of the joint and the pathological changes which had taken place in and around it. These methods may be classified as follows:

1. Brisement forcé.
2. Arthrolysis.
3. Pseudo-arthrosis in the neighborhood of the ankylosis.
4. Resection.
5. Transplantation of the entire joint.
6. Arthroplasty.

I shall pass very hurriedly over all of these methods with the exception of arthroplasty, the method with which this paper has to deal.

1. *Brisement Forcé.* This naturally was the first method used in an attempt to produce the motion desired. When the ankylosis was a pseudo-arthrosis—and was due to periarticular inflammation—the result at times was good. When there was any bony ankylosis of the joint itself, however, or even in a fibrous joint the results were and are not only negative but serve to make firmer the ankylosis which already exists. Care must be taken in the selection of cases for this method. When there is intra-articular ankylosis of any nature the results are bad, and too often we see untoward results, as fractures of bone, tendinous attachments torn away, paralysis, temporary or permanent and vasculatory disturbances.

2. *Arthrolysis.* Julius Wolff opened up an elbow-joint, and without resection separated the ankylosis by knife or chisel, and then by continuous motion sought to obtain mobility. Good results are reported by him and likewise by von Eiselsberg. The procedure is always a painful one not generally followed by satisfactory results. In cases of periarticular inflammation, and even when there is some

slight adhesion of a fibrous nature within the joint, the injection of sterilized oil followed by successive brisement forcé seems to aid in the production of mobility (W. S. Baer), but is absolutely contra-indicated in fibrous or bony ankylosis of joints.

3. *Pseudo-arthrosis.* This was first attempted in 1826 by Barton, of Philadelphia, and later by Rodgers, Esmarch, Sayre and others. This operation consisted in osteotomy, or the removal of a section of bone, in the neighborhood of an ankylosed joint. Constant manipulation was then instituted but almost invariably with a subsequent return of the ankylosis.

4. *Resection.* This method has played a most important part in the production of mobility. Since the first resection of the elbow-joint for ankylosis by Defontaine and later by Helfereich, the method has been universally adopted when conditions were favorable. A proper regard must be paid to the preservation of the muscular attachments, so that after the resection of the joint the power to move in definite directions will be present. Resection of joints, however, has its limitations and cannot be used in those cases in which the element of stability is an absolute essential. The operation for resection, however, and the physiological changes which take place after resection has been accomplished have been the final step which has brought us to the arthroplasty of the present, and I feel rather certain that if proper separation could be retained between the bony fragments, all resected bones would be covered by a fibrous tissue which would make a movable joint without the aid of interposing mediums. In the preservation of that separation, however, lies the chief difference between resection and arthroplasty.

5. *Transplantation of the Entire Joint.* Very little has as yet been done along this line in man. Lexer reports two operations on the knee-joint with perfect healing and good function after a year and a half.

6. *Arthroplasty.* The first operations in which surgeons tried to produce mobility in ankylosis were in those conditions in which the lack of motion imperiled the life of the patient. Naturally, therefore, the temporomaxillary articulations, the continued ankylosis of which presented so serious a situation, was the joint in which arthroplasty was first attempted. Esmarch first tried to make a resection of the condyle of the inferior maxillary bone in a case of ankylosis of this nature, but union soon reoccurred. In 1863 Verneuil did the same operation but turned in a part of the capsule between the temporal and maxillary bones. This was followed by the work of Ollier, Helfereich (1893), Lentz and Henle who, instead of using the capsule made a muscle flap of the temporal muscle for their interposition. Two years later Mikulicz did the same operation, but used a flap from the masseter muscle. This was soon followed by Hoffa, Kusmetzow, Rochet and Schmidt, varying the muscle and bone operation. Most of these authors succeeded in obtaining some slight degree of mobility. A little later Gluck, in 1902, used a flap of skin in place of the muscle flap. A certain amount of motion having been obtained in the operations on the temporomaxillary articulation, other joints were used as the field of work, namely, the elbow, the hip, and the knee.

Certain experimental pieces of work were carried on about this time. Foedere carried out experiments on the joints of fowl. He used as the material for keeping apart the adjacent bones not the living flap but such organic materials as the bladder of the hog and ovarian cyst wall, and with these he was able to obtain good, movable joints in from fifty to ninety days after their insertion. In 1900 Klumsky carried on a large series of animal experiments with such absorbable and non-absorbable inorganic materials as tin, zinc, silver, celluloid, rubber, collodion, decalcified bone, and magnesium plates. He came to the con-

clusion that magnesium plates gave the best results. Orlow soon followed this by the use of metal plates. As the results with the inorganic substances offered marked difficulties which the organic materials did not present, the work of the more recent years has been made with the latter. In 1905 Querin used tendons for his material, and in the same year Murphy recommended the use of a flap of fascia and fat. In 1909 I reported a series of cases of operations on various joints in which chromicized pigs' bladder was used. Thus it seems that the substances used to keep the newly formed bones apart may be divided into two classes, the organic and the inorganic. The chief organic materials which have been used are magnesium plates, celluloid, tin, and zinc. The organic material may be either dead or living, and the living tissue may be transplanted free or may be used, and generally is used in the shape of a flap, be it muscular, fatty, or fascial.

Pathology. The use of any material, organic or inorganic, viable or non-viable, in an arthroplasty is to prevent the union of the raw surfaces of which the newly formed joint is made. What are the histological findings in the various materials used and just how is the new articulation made? Murphy in his fascia and flap transplantation describes it as follows: "Hygromata is the combined product of liquefaction of hypertrophied connective tissue. In the development of artificial joints it is the utilization of this transformation of fat and connective tissue into hygromata that gives us movable, sliding endothelial lined surfaces which so closely resemble joints." Neff, in his very complete review of the subject of arthroplasty, describes the microscopic appearance of a flap of fat and rectus aponeurosis placed in the knee of a dog as follows:

"Dog was killed four months after the arthroplasty. The tibia and femur are separated by a pad of connective tissue (the transplanted rectus aponeurosis), which is firmly

adherent to the bony surface above and below. In the center of this connective-tissue pad are two bursal sacs, each one-half inch in diameter, and filled with a clear, thick fluid resembling the contents of a ganglion. These two bursal sacs are situated side by side, the outer one between the external condyle of the femur and the external tuberosity of the tibia, and the inner between the internal condyle and the internal tuberosity. It will thus be seen that the bursa formed where the pressure was greatest. Microscopic examination of the walls of the bursal sacs shows a fibrous connective-tissue structure, the nuclei and cell bodies of which stain well. That portion nearest the bone has become vascularized, and some of the bloodvessels are of considerable size. The lining proper of the bursal sacs is merely a condensation of the fibrous connective tissue, in which the cells and nuclei are more closely packed together than in any other portion. There is no evidence of flattening of lining cells."

Davis, in his experiments on the transplantation of free fascia into the resected knee-joint of dogs, states that "At autopsy the fascia was adherent to the denuded end of the femur but to no other portion of the joint. Its structure was well preserved. The microscopic examination showed well-nourished fascia with normal staining. No new endothelial lining."

I have had the opportunity to reopen a joint on four different occasions in which I had performed an arthroplasty with the use of chromicized pigs' bladder as the material of interpolation. In the joints the membrane had been absorbed, but a space following in the outlines of the joint persisted in each case. The lining of the cavity was perfectly smooth. The microscopic sections made from the walls of these newly formed joints were as follows:

The chromicized bladder had been invaded by round-cell infiltration from the side next to the denuded bone.

The round cells permeated the membrane, which at first became quite cellular in character. These cells finally became diminished in number and the tissue adherent to the bone was changed into a fibrous mass. The cells toward the joint side became flattened out, but there was no distinct endothelial lining to the joint. The fibrous tissue on the adjacent bones showed no tendency to coalesce. A very noticeable feature was the entire absence of giant cells which one generally sees in the tissue surrounding any foreign body. From these findings we would conclude that the membrane is transformed into a fibrous tissue which covers the denuded bone, and that a joint-like space is formed with fibrous walls similar in all respects to the walls of a cavity encysting a foreign body.

It has been shown that both organic and inorganic materials—viable and non-viable—have been used in the production of arthroplasties, and that most of them have been able to give the sought-after mobility to greater or lesser degree. Even the cases of resection alone have under proper conditions given good results. Any medium, therefore, which will efficiently separate the raw, bony surfaces until the fibrous tissue is formed will give us a cavity simulating a joint and pertaining to the function of a joint.

Results from Use of Absorbable Membrane. The results of the work which I have been carrying on during the past eight years with an absorbable animal membrane in the production of mobility in ankylosed joints are based on the findings in 100 cases in which a chromicized pig's bladder has been used as the transplanted medium, and these cases have been carefully watched for a period varying from eight years to six months. It has seemed to me that any substance which would remain as placed for a sufficient length of time until the joint surface could be formed and then should be absorbed, would be the ideal substance to be used for interposition between bony sur-

faces. The advantage which the use of an absorbable membrane has over a muscle flap, a fascia flap, a fascial and fatty flap, and non-absorbable inorganic plates is as follows:

1. *The Joint Will Remain as Near Its Normal Shape and Size as is Possible.* Owing to the thinness of the material inserted the minimum amount of resection on bony surfaces has to be made. The fact that it is perfectly free allows it to be handled with greater ease, so that our bony modeling can be reduced to a minimum.

2. *Simplicity in Operation.* The bulk of the material transplanted being very small the size of the operation is necessarily reduced. Having no pedicle attached but being absolutely free, the dissection about the joint, which materially increases the extent and time of the operation, when the flap operation is the one of selection, is necessarily done away with.

3. *Stability of the Joint.* The stability of the joint is not necessarily destroyed, as must be the case in all flap operations, when the capsule is used as the interposed medium, or when its integrity is interfered with by the fascial operations.

4. *Infection.* There is far less chance for infection, owing to the lessened handling of the parts, to the simplicity of the operation, and to the fact that the blood supply is less interfered with, since no extensive periarticular operation has to be made, as is necessitated by a flap operation.

5. *After-treatment is Less Painful.* In the flap operation, as the formation of the joint is said to be due to the production of a hygroma, constant motion must be instituted soon after the operation which, as we all know, is extremely painful. In a membrane operation absolute rest of the part should be continued for at least three weeks, else the membrane may be torn or displaced and

the new joint formation fail in the making. This necessarily does away with the painful manipulation when the joint is in the acute postoperative stage.

6. *Normal Joint the Ultimate Result.* As the membrane, after a period varying from 60 to 100 days is entirely absorbed, there is no foreign substance left continuously within the joint. If I may be apparently paradoxical the membrane by its absence will allow the motions of the joint to approach the normal in character.

The Membrane. The membrane to be serviceable for arthroplastic purposes must possess certain definite characteristics. It must be thin and flexible. It must be thin enough to necessitate the least possible resection of the joint surfaces, and when moistened must be so pliable that it conforms accurately to the configuration of the modeled bones. It must be tenacious enough to withstand disintegration for a period of from sixty to one hundred days, giving time for the new fibrous covering to be formed on the surfaces of the new joint. It must be durable enough to withstand the traumatism and insults which are forced upon it by the pressure of the ends of the bones. It must be prepared in such a manner as to be absolutely aseptic. After experimenting with many materials a membrane embodying all the requirements was found in the submucosa of the pig's bladder. The membrane is prepared by Messrs. Johnson & Johnson, as follows: The pigs' bladders having been carefully selected are thoroughly cleansed and disinfected and the submucosa obtained. They are then soaked for twenty-four hours in a medium hard potassium chromate solution, after which they are cut into the proper sizes and are stretched on boards and exposed to the sunlight for three days until the color changes from a bright orange to greenish brown, the change in color corresponding to the reduction of the chromic salt. After being freed from all their soluble chromic salts they are thoroughly

dried and are then inserted into sterile glass tubes containing chloroform. At the time of the operation these tubes are boiled for five minutes. The tube is then broken and the membrane placed in normal salt solution for ten minutes before using.

Operative Technic. I shall, as succinctly as possible, describe the operative technic in arthroplasties of the temporomaxillary articulation, the hip-joint and the knee. It is needless for me to say that the strictest principles of antiseptic surgery must be faithfully carried out in operations of this magnitude in which the joints are necessarily subjected to an unusual amount of handling and traumatism.

Temporomaxillary Articulation. The field of operation having been thoroughly prepared by scrubbing—using potassium permanganate, oxalic acid, bichloride of mercury, ether, and alcohol—an incision is made parallel to the zygoma and along its lower border, and the fibers of the external pterygoid muscle are separated, the temporal muscle being retracted forward. The dissection should be done carefully so as to avoid the supraorbital branches of the facial nerve. The muscle having been retracted we can now cut through the periosteum of the ramus of the inferior maxillary bone and expose the condyle. With an osteotome and chisel we must separate the condyle from the ramus and also the condyle from the temporal bone at the seat of the ankylosis. If the coronoid process is also adherent a resection of this is made at its junction with the inferior maxillary bone and it is removed. After complete stopping of hemorrhage the remaining bone is thoroughly rounded off and a cuff of membrane is placed around it and sewed with sixty-day chromic catgut sutures to the periosteum of the bone. The bone must be well covered, no free spaces allowed to exist, and no redundancy of membrane permitted to remain. The muscle is then brought

together and sewed securely and the subcutaneous tissue brought in close coaptation. The skin is sewed with subcutaneous catgut, no drainage being made. The tighter the wound is sewed the less likelihood is there of any serous discharge. The skin wound is covered with sterilized silver foil and a plaster dressing applied, going over the head. The patient is kept perfectly quiet for two weeks, no attempt at motion being made during that time. The patient is fed on liquids by spoon or tube. At the end of two weeks all dressings are removed and the patient is encouraged to use the mouth, increasing the amount of motion by the use of graduated corks, increasing in size.

Hip-joint Articulation. Thorough preparation of the field of operation is made by scrubbing with potassium permanganate, oxalic acid, alcohol, ether, and mercuric chloride. An incision is made, starting from the anterior superior spine and going down the thigh parallel to the femur, between the tensor femoris muscle on the outer side and the sartorius on the inner side. The muscles are separated and the capsule presents itself in the wound. An incision is now made into the capsule parallel to the neck of the femur and the capsule is forcibly stripped back from the underlying bone. The entire neck and head of the bone, together with the margin of the acetabular cavity, are now exposed. With a curved chisel a small portion of the head is resected and the remainder of the head dislocated forward in the wound. The head is now rounded off, care being taken to retain its anatomical shape as far as possible. The portion of the head in the acetabulum is curetted and a new socket made with the aid of a proper burr. The arts and crafts part of the operation is performed as accurately as possible so that the mechanical play will be as accurate as can be obtained. The more accurate the mechanical work the better will be the ultimate results. A piece of membrane cut into proper shape

is now thrown around the newly modeled femoral head and sewed about the trochanter into the bone itself with Murphy needles. If the leg be now rotated in marked rotation inward, then in marked rotation outward, and then in an intermediary position the field of sewing will always be directly under one's hand. In this way the newly formed head is entirely closed off, care being taken not to leave any raw surface. The head is now restored to its newly formed socket. It will thus be seen that the membrane forms a perfectly retained lining between the head and the acetabulum. As far as possible the capsule is now brought together and the muscles sewed tightly over the joint. The subcutaneous tissues are accurately approximated and the skin sewed with a subcutaneous silver wire. No drainage is used. The patient is now encased in a plaster spica, from the toes to the waist, and is allowed to remain perfectly at rest until the end of the fourth week, when passive motions are instituted. As soon after that as advisable he is encouraged to use the leg. In certain cases in which the radiograph shows marked new bone formation, particularly about the posterior border of the acetabulum, a curved incision is made beginning at the anterior superior spine, going down over the trochanter and coming out at the posterior superior spine. The top of the trochanter is chiseled away from the femur, leaving the muscles attached to it. This gives an excellent view of the entire neck of the femur, of the head, and of the ilium. The head is now recovered from the socket as previously described and the operation proceeds in a similar manner. On closing the portion of the trochanter removed is nailed at its original site.

The Knee-joint Operation. In the preparation of the patient the leg from the knee down to and including the toes should be wrapped in sterile dressings so that the joint may be bent freely and yet without fear of infection.

The site of operation is prepared as indicated in the operation on the hip-joint—an Esmarch bandage may be used—but care should be used to see that all bleeding has been stopped before the wound is closed for fear that a hemorrhage may tear the membrane from its moorings. Two lateral incisions are made parallel to the long axis of the leg, one on each side of the patella. The adherent capsule is then pressed back toward the condyles until the lateral ligaments are reached. The adherent patella is chiseled away from the femur and all adhesions of whatever nature are cleared away from the most dependent portion of the joint to the top of the subquadriceps bursa. The line of demarcation of the femoral-tibial articulation is then made out and the femur and tibia separated by periosteal elevator or chisel according to the character of the bony ankylosis. The separation having been made and the capsule thoroughly freed the leg is forcibly but carefully flexed so as not to evulse the tibial tubercle. The condyles or tibia are now remodeled. All new bone formation is removed, and they are restored as near as possible to their proper anatomical shape. Care should be taken not to remove too much bone. The more normal the size and shape of the parts the more perfect will be the character of the motion obtained. The posterior capsule is pushed well back so that the posterior surface of the condyles is perfectly freed from the surrounding tissue. The joint surfaces now being entirely free the limb is carried through its entire arc of motion. The lateral ligaments, and in most cases the semilunar cartilages, are entirely destroyed. The membrane is then inserted in the newly formed joint, generally in two pieces. The first piece is carried through the opening on one side of the patella and brought out on the other side. The edge is carried far up behind the posterior surfaces of the femoral condyles, beyond the area of articulation, even when the knee is in extreme flexion. One of the most

difficult parts of the operation is to anchor the membrane in the inaccessible posterior condylar region. I have therefore adopted the suggestion of Dr. Starr, of Toronto, which is to attach two sixty-day chromicized catgut sutures to the edge of the membrane and then piercing the joint from within outward, carefully avoiding all vessels and nerves, to tie the two sutures together in the popliteal space. This plan has worked most satisfactorily. The membrane is now cut so as to conform to the shape of the joint and the edges are sewed into the covering of the bone, at the reflection of the capsules, with sixty-day chromicized catgut. Care must be taken to have the joint surface smoothly and uniformly covered throughout its entire extent. A second piece of membrane, partially overlapping the first, is now introduced, and the remainder of the joint is covered as far up as the top of the subquadriceps bursa. For sewing the membrane about the edge of the joint a needle with a small curve, but quite thick, which can go through the covering of the bone without breaking, will be of the greatest help.

The membrane being firmly fixed the capsule is brought together tightly by sixty-day chromicized catgut so as to withstand the tension of the effusion which later occurs in the joint. Having closed the skin the leg is encased in plaster from the groin to the toes and a window is cut over the patella in order to relieve the pressure. The leg should be kept absolutely quiet for four weeks, so as not to tear the membrane and so increase the chance of ankylosis. In the more recent cases of operations upon the knee a curved horseshoe incision, going directly through the patella tendon, has been used in place of the two lateral incisions. This gives a more perfect exposure of the joint, and as no motion is attempted for four weeks it allows sufficient time for the healing of the patella tendon.

The series of cases to which I desire to call your atten-

tion comprises 100 cases in which I have used the chromicized pigs' bladder. A brief summary of each one will be found at the end of this communication for those who wish to study them in detail. The series covers a period of eight years, so that the ultimate results in a large proportion of them have been ascertained.

The joints operated on have been the following: 9 temporomaxillary joints, 50 hip-joints, 28 knee-joints, 3 phalangeal articulations, 1 ankle, 3 elbow, and 2 radioulnar articulations, 3 shoulders, and 1 tendon sheath. In both the hip and knee-joints, if the amount of motion is very slight, the utility of the joint would be far better if complete ankylosis were present. Consequently in these two joints, namely, the hip and the knee, I have arbitrarily assumed that if a patient has less than 25 degrees of voluntary, painless motion the case shall be recorded as a failure, although enough of a joint surface may have been produced to make a slight amount of motion possible. If we consider the cases as a whole, irrespective of the joint involved and irrespective of the etiological factor, we have by the use of the chromicized pigs' bladder obtained voluntary motion, painless and useful, in 68 per cent. of the cases.

Results in Ankylosis of Jaw. As has been stated, the temporomaxillary joint was the first joint on which operation for mobility was attempted. The impairment of the general health by reason of the ankylosis made attempts at operative interference imperative. Of late years arthroplastic operations and at times even resections have given favorable results. Hoffa in his article collected 18 instances of operations of this kind, in 13 of which muscle flaps were used. In most of these cases a good result was obtained. Hoffa himself operated on 2 cases, one with a simple resection giving a separation of 2 cm., the other with a flap of the temporal muscle (which resulted in allowing

two fingers to be placed between the jaws). Bierman, in 1909, and Stein about the same time reported excellent results also with the use of muscle flaps. Osgood reports an excellent result with the use of Baer's membrane. My cases, 9 in number, in which 11 temporomaxillary jaws were operated on, all gave good results with one exception or an excellent result in 91 per cent. Case 1, a boy with double ankylosis, following scarlet fever at the age of three years, was operated on by the method previously described. Both the condyle and the coronoid process on the one side and the condyle on the other were resected and an animal membrane inserted. The boy now has even more motion than normal in the jaws, a possible separation of 4.5 cm., and eats as well as any normal boy. Moreover, the nasal inflection of the voice existing before the operation has almost entirely disappeared. Previous to the operation the lower jaw was undeveloped and was placed behind the superior maxillary bone for a distance of half an inch, and this has been stimulated in its growth by the excellent work of our odontologist, Dr. Kelsey, until the teeth are in proper coaptation throughout their whole extent. Case 8, in which the patient had been previously operated on twice in New York without result, now with the membrane operation has a possible separation of 3 cm. This patient was thirty years of age at the time of the operation, and had had complete ankylosis for twenty-three years.

In Case 2, a patient who had marked cicatricial changes in the mouth as well as complete ankylosis of the jaw, after a membrane operation, was able to open her mouth to the extent of 0.5 cm.

Cases 3, 5, 6, 7, 8, 9 all gave excellent motion. There was one death from the operation, Case 4. This was a baby, aged eighteen months, with double ankylosis, the

child being very weak and emaciated. The operation was undertaken at the insistence of the parents, as they had lost two children previously, due to the same congenital deformity. This was a case of congenital union, not only of the temporomaxillary articulation, but of a bony synostosis of the superior and inferior maxillary bone, as far down as the first molar. The operation was only performed as a desperate effort to save life. The child, however, stood fairly well to the operation on one side, but succumbed to the operation on the opposite side.

It will thus be seen that the temporomaxillary articulation is most favorable for the production of mobility after complete bony ankylosis. Most of the surgeons have used a flap of muscle, mainly temporal, but also the masseter as well, and even resections alone in the hands of a skilful man have given good results. The insertion of the membrane, however, is much simpler than a flap operation and has given most excellent results.

Results in the Hip-Joint. The results of operations on the hip-joint for producing mobility in complete ankylosis are most satisfactory. The joint by its anatomical structure offers the maximum amount of opportunity for success—a ball-and-socket joint, in which the weight-bearing is done mostly by the joint itself, while the capsule and ligaments play but a small part in its stability. Considering the amount of its excursion it presents but a minimum amount of articular surface. The muscles which surround it are used for motion rather than play an important part in its support, as is the case particularly in the knee.

In 1906 Hoffa presented the cases which had been reported up to that time. They were 7 in number, 3 by Rochet, 2 by Nelatson, and 2 by Murphy. The results were only fair except in one case of Murphy's, with an excellent result, in which a fascial flap was used. Hoffa

reported one case with the use of a flap of fat and fascia, giving good passive motion but poor active use. Stein, in 1908, reported a case of bony ankylosis of both hips in which the left hip gave 15 per cent. of motion and the right hip 20 per cent.

In a previous paper I reported 2 cases in which the chromicized membrane was used, in the first case 90 degrees of motion was obtained six months after operation, and in the second case 50 degrees of motion was gained. Both cases are included in the series which I will now mention. Lopez Duran, in 1910, with the use of the membrane, reports a case of ankylosis of the hip in which the motion obtained was 50 per cent. of the normal.

In the present series there are 50 cases of bony ankylosis of the hip-joint in which an arthroplasty has been done with the use of the chromicized pigs' bladder. Of these 50 cases 40, or 80 per cent., have given good, voluntary motion, free from pain, of 25 degrees or more. Of the ten which have failed one retained a motion of 20 degrees and the others became completely ankylosed.

I have divided this series of hip-joint operations into four groups according to the etiology of the disease:

A. 9 cases of gonorrheal arthritis.

B. 21 cases of tuberculosis.

C. 15 cases of infected hips other than gonorrheal or tuberculous.

D. 5 cases of arthritis deformans.

Group A. Gonorrheal Arthritis of the Hip. All of the patients showed complete bony ankylosis. The resulting active motion was 90, 20, 40, 60, 100, 90, 45, 95, and 90 degrees, or 89 per cent. Case 11, in which the patient had motion of only 20 degrees, and is therefore classified as a failure, was operated on by me in a distant city and suppuration occurred. This finally healed, with the result as noted, and the patient is much improved, owing to the

fact that, although the motion is, for my purposes, nothing, the improved position of the leg from the marked position of adduction and flexion existing previous to the operation has been of greatest service to her. The case which has given but 40 degrees of motion I am sure will continue to improve as the periarticular tissues become stretched.

Group B. Tuberculosis of the Hip. In this series of 21 cases, 14, or 66 per cent., show good voluntary mobility ranging in an arc of from 30 to 110 degrees as follows: 7 of 0 degrees, 3 of 30, 2 of 45, 2 of 50, 1 of 75, 4 of 90, 1 of 100, and 1 of 110 degrees. In the cases in which ankylosis recurred the result was due to the fact that, at the time of the operation, an active but inspissated focus of tuberculosis was cut into, with the result that tuberculosis of the hip was set up. The utility of all these newly formed joints was perfectly good, no artificial help being used in walking except in Cases 38 and 40, in which an arthroplastic operation on both hips was done. The patient uses a cane as an aid in walking, owing to the fact that the left knee is held in flexion of 45 degrees, due to the scar tissue on the posterior part of the thigh, secondary to the original trouble in the hip.

It will be noticed that the production of mobility in tuberculosis of the hip is not quite so good as in gonorrheal arthritis; 66 per cent. in the former and 89 per cent. in the latter. This was naturally to be expected, for one never knows in tuberculosis when one may light up an inspissated focus of tuberculosis and so vitiate one's arthroplasty, while in gonorrheal arthritis one never operates until one knows the infection is over. The resultant range of motion in tuberculosis of the hip is apt to be a little less than in cases of gonorrheal arthritis. This again was naturally to be expected when one considers the usual sinus formation and consequent scar tissue so often seen in tuberculosis.

The question of age seems to exert no important influence in the production of mobility or in the amount thereof in tuberculosis of the hip. There may be, and to my mind are, however, important reasons why one should defer the operation of arthroplasty in these cases until epiphyseal ossification has taken place.

Group C. Infection Arthritis of the Hip. In this series an arthroplasty was performed with the use of chromicized animal membrane on 15 cases, in all of which bony ankylosis had taken place with the entire destruction of all joint structures; indeed, in no case could the line of demarcation between the acetabulum and the femoral head be made out. In all of these cases 100 per cent. of good, serviceable motion was obtained, ranging in amount from 45 to 90 degrees as follows: 1, 30 degrees; 4, 45; 3, 50; 1, 70; 2, 75; 4, 90 degrees. In most of the cases the infection was a systemic one, producing bony ankylosis in two hip-joints in four cases. The excellent results in this series can be accounted for mainly by the nature of the infection, an acute septic process with rapid joint destruction, accomplishing its destruction quickly, although extensively, while the periarticular tissues are not so badly involved; so when the new joint surface has been made there is less interference with motion from the neighboring periarticular structures than in tuberculous or gonorrheal arthritis. These joints, while having a good range of motion, are all of the greatest use and free from pain. In case 51, a man, who was forty-nine years of age when operated on and whose hip had been ankylosed for thirty-nine years, two years after the operation was working daily at his trade as a painter.

Group D. Arthritis Deformans. This comprises 5 cases of acute arthritis deformans. I am using the term "acute arthritis deformans" for this reason. All are cases of absolute ankylosis of the spine, with ankylosis of the hip,

knees, and ankles. It did not come on gradually and insidiously as does the usual type of arthritis deformans, but more acutely, there being periods of only three or four months between the invasion of each joint. The usual membrane operation was performed. In one case 80 degrees of motion was obtained, in another 50, and in another 35 degrees, while in 2 cases no ultimate motion was gained. This gives a percentage of success in this type of 60 per cent. I attribute the positive result in some cases and the negative result in others to the fact that the disease in the first group had been absolutely stationary for many years, while in the second group the process was still subacute, new joints having been recently involved.

I should advise at present against the arthroplastic operation in cases of arthritis deformans, certainly at least until several years have elapsed since any activity of the disease has been shown.

Looking back now on arthroplasty of the hip-joint I cannot help but feel that the prognosis for successful arthroplasty is more than good in properly selected cases.

Arthroplasty of the Phalangeal Joint. Motion can be produced in the phalangeal joints by arthroplasty, but the motion has to be greater in amount to be of any service than in any other joint in the body. The production of the full amount of motion is usually not obtained, owing to the intimate relationship between the tendons controlling the joint motion and the bone. Periarticular inflammation reaching the tendon sheath invariably limits the mobility of the joint even though the joint be normal. Hence, in giving a prognosis in this class of cases one should be governed not only by his ability to produce mobility but should consider the usefulness of the mobility after it has been accomplished. Cases in which the ankylosis is due to a fracture or pathological changes entirely within the joint offer a better prognosis than those in which the inflam-

matory periarticular tissue exists. Hoffman, in 1908, reported a case of fibrous ankylosis in the interphalangeal joints in which he interposed a periosteal transplant. Six weeks after he reported good passive but no active mobility.

In my series there are 3 cases, Nos. 60, 61, and 62, which give a mobility of 60, 50, and 45 degrees respectively. In the latter case, which was due to an old fracture, the motion obtained was voluntary, but in the first two, in which an inflammatory mass was the cause of ankylosis, only a portion of the amount obtained was active.

Arthroplasty of the Elbow-Joint. According to most of the authors who have reported on the subject the elbow-joint is the joint *par excellence* for the production of mobility. Many surgeons, as Nelatson, Delbet, Murphy, Schanz, Kirmisson and others, have reported cases generally with good results both as to function and utility. Various substances have been used for the interposition, muscle flaps, fascial flaps, metal plates, and fatty flaps. The muscle flap on the whole has given the best functioning joint.

I have had three cases of arthroplasty of the elbow-joint, with only one fair result. Case 63, bony ankylosis of the elbow, due to gonorrheal infection, in which I interposed the animal membrane, was a failure, the ankylosis recurring in three weeks. In the second case I had a genuine infection followed by pyemia, which ended fatally, this being the second death in the entire series, making a mortality of 2 per cent. In the third case 25 degrees of motion was obtained. Dupuy recommends the total resection of the elbow-joint and the interposition of a portion of the brachialis anticus muscle.

As we study the cases we are impressed with the fact that when thick substances, such as muscle, are interposed the best results are obtained. Considering the anatomy of the joint, a joint which is always dependent, which bears no body weight, in which stability does not have to

be obtained, is it not possible, indeed, is it not probable, that the resection which is necessary to interpose the muscles has been the cause of the motion rather than the muscle flap itself?

Before considering the subject of arthroplasty of the knee-joint there are 3 cases, 1 of a congenital synostosis of the radial head and ulna, 1 of a bony ankylosis of the ankle, and 1 of a union between the radius and the ulna due to a fracture, which I will briefly mention. One, Case 66, with the use of the animal membrane, gave a voluntary motion of 110 degrees. The motion in rotation would have been quite normal had it not been for the marked curvature of the radius, which made a limitation of 110 degrees necessary. Another case was that of a bony ankylosis between ulna and radius due to a fracture. The bones were chiseled apart, 90 degrees of supination and pronation resulted. Case 68, bony ankylosis of the astragalotibial joint, is of particular interest, as a bone graft of the fibula had to be made before the arthroplasty could be performed. Suffice it to say that after a gunshot wound of the ankle with destruction of three inches of the fibula and osteomyelitis of the tibia, with entire destruction of the astragalotibial articulation, a bone-graft operation was made, closing in the gap of the fibula and giving stability for the ankle-joint after it was made. Later, a membrane operation was performed between the astragalus and fibula and a new joint was formed—giving voluntary motion of 30 degrees—on which the patient walks without aid and without discomfort.

Results in the Knee-Joint. This is naturally the most difficult joint in the body from an anatomical standpoint in which to obtain satisfactory motion of a free and painless character. In the first place it is made up of two joints in one, the patella-femoral articulation and the tibia-femoral articulation, both of which have to be taken

care of at the same operation. It presents a larger amount of articular surface than any other joint in the body, and this surface in its entirety has to be made perfectly if the resultant motion from an arthroplasty is to be normal in amount and function. A normal knee-joint has two important functions: first, mobility; second, stability. The stability of the joint in the knee is not produced by the anatomical structure of the bones, but is accomplished by ligaments, muscles and the capsule. The crucial ligaments in a complete bony ankylosis have been invariably destroyed and the stability of the joint must be borne by the quadriceps muscles, the lateral ligaments and the capsule, especially the posterior portion. Hence, these structures must be preserved in an arthroplasty, which has for its object stability as well as mobility. Any operation which in its nature sacrifices these structures will if successful, so far as complete mobility is concerned, produce a flail-joint, a result which is not only undesirable but of necessity to be avoided in the knee. The results of arthroplasty in true bony ankylosis between the femur and tibia are still far from satisfactory. Hoffa, after reviewing the operations previous to his and after consideration of the results of the 8 operations performed by himself, came to the conclusion that when one took into consideration the extensiveness of the operation and the prolonged, painful after-treatment the small amount of motion resulting hardly justified the attempt. Payr, in 1910, reached a similar conclusion. I think if one carefully scrutinizes these cases in which the records and roentgenograms are presented to us for inspection, one finds there has been good, serviceable motion attained only in those cases of a fibrous ankylosis between femur and tibia or of a bony ankylosis between patella and femur. And while I am sure there has now been produced a true knee-joint between the femur and tibia in bony ankylosis, I believe it

yet remains for the future to demonstrate the utility of the newly formed joint, by further investigations and experimental work on the periarticular tissues, which will ultimately allow us the motion desired and at the same time preserve the necessary stability. My cases, 28 in number, I have divided into three groups:

1. Fibrous ankylosis between patellafemoral articulation and fibrous ankylosis between tibiofemoral articulation.

2. Bony ankylosis between patellafemoral articulation and fibrous ankylosis between tibiofemoral articulation.

3. Bony ankylosis between both patellafemoral and tibiofemoral articulations.

Group 1. Fibrous ankylosis between Patella and Femur and Fibrous Ankylosis between Femur and Tibia. In this group there are 7 cases. The amount of mobility obtained was 20 degrees in 2 cases, 50 degrees in one case, 55 degrees in one case, 40 degrees in one case, 75 degrees in one case and 0 degrees in one case. All of these cases, except one, which is gonorrheal, are tuberculous in character. In all the synovial membrane, crucial ligaments and cartilages had been destroyed and there was dense fibrous tissue between the capsule and the bone. It will thus be seen that in 4 cases, or 57 per cent., giving 75, 40, 550 and 55 degrees of motion respectively, good function resulted, while three were failures, 20 degrees, 0 degree and 20 degrees. In the three cases which are classified as failures, an active tuberculosis was set up by the operative interference, which entirely vitiated the results. The tuberculosis, however, soon became amenable to treatment.

Group 2. Bony Ankylosis between Patella and Femur and Fibrous Ankylosis between the Tibiofemoral Articulation. In this group there are 5 cases, giving 100 per cent. cures, 75 degrees, 110 degrees, 40 degrees, 55 degrees,

and 50 degrees. Two of these cases were gonorrheal in origin, 2 infectious, and 1 tuberculous. It will thus be seen that this type of cases (in which there is a bony ankylosis of the patella, but the tibiofemoral articulation is normal, as in Cases 80 and 81, or when cartilages and crucial ligaments are destroyed and fibrous ankylosis has recurred between femur and tibia, as in Cases 83 and 84) lend themselves readily to a membrane arthroplasty with excellent results.

Group 3. Bony Ankylosis between Patella and Femur and between Femur and Tibia. There are 16 cases in all, giving motion in 19 per cent.: 7 giving no ultimate motion, 6 giving motion of 20 degrees, 2 of 30 degrees and 1 of 45 degrees. That is, 7 cases gave no motion and 6 cases gave 20 degrees, or 81 per cent. of failures, while 3 gave useful motion of only 30, 45, and 30 degrees respectively. Of the 7 cases that gave absolutely no motion, 2 did so owing to a secondary infection, 1 from a gonococcal-like organism obtained from the wound at the time of operation. The other 5, while giving slight motion for a few months following the arthroplasty, gradually by new bone production, again became ankylosed. Of the 6 cases whose resultant motion was 20 degrees, all were true bony ankylosis of gonorrheal origin. For the first two months following the arthroplasty the motion was fair when tried passively, but at the end of the third month, accompanied by new-bone formation, the motion diminished until there was only 20 degrees of active motion, at which it has remained ever since. Of the 3 cases which are reported as successes, 1 gave 45 degrees and the other 2, 30 degrees. This can only be held to be a partial success, owing to the limited arc, although that which has been obtained is painless and useful—a long time after the operation.

It will thus be seen that in arthroplasties of the knee, those with fibrous ankylosis of both patella and femur and

femur and tibia lend themselves to good, functioning joints, unless one sets up a recurrence of the original trouble; that bony ankylosis between femur and patella can be almost invariably successfully dealt with; that the results of arthroplasty in bony ankylosis between femur and tibia are as yet unsatisfactory, although much is to be hoped for when we can better learn how to control new bone formation, after extensive modeling of the bones, and when we can better handle the periarticular tissues.

The object in using a chromicized membrane is to obtain a substance which will remain intact for a period long enough to allow the changes to occur which take place in the construction of the fibrous tissue over the end of the bones. At the end of the time it should be absorbed, leaving no foreign body, living or dead, within the joint. In this way the joint can approach in character nearest the normal. Such a membrane is found in the chromicized pig's bladder, which has been found experimentally and at second operations on the human subject, to remain intact from 60 to 100 days, a period long enough to allow the joint to be made.

In the use of the chromicized animal membrane there are a few points to which it may be wise to call your attention.

The operation of arthroplasty calls for the greatest possible care in technic, although there is not the same amount of traumatism or interference with the circulation in the periarticular tissue as is caused by the various flap operations. At the same time the utmost care must be taken in the antiseptic treatment.

For ten days or two weeks following the operation there is a slight elevation of temperature, running as high as 101 F. at times, which at the end of that period soon subsides. This probably is due to the foreign material left temporarily within the joint, and to the amount of chromic acid used in the preparation of the membrane.

The wound both as to capsule, periarticular structures, and skin should be sewed very tightly. This is in order to prevent the evulsion of the membrane, or a serous ooze (free from bacteria, but at times mistaken for pus), which if the wound be not tightly sewed ensues for a time. In the past two years the membrane has been made less thick, and hence not so much chromic acid is used. The serous discharge has therefore been eliminated. This serous discharge has occurred in about 10 per cent. of the cases. It does no harm, but should be left severely alone, no probing being permitted. Occasionally portions of the membrane are evulsed, but if this occurs late in the arthroplasty no harm is done, as the joint is by that time formed. In sewing the membrane into the joint sixty-day chromicized catgut sutures should be used so as to attach the membrane firmly to the place desired and so that we may be sure that all the joint remains securely covered for the period desired. The membrane should fit neatly, no redundancy being allowed to occur. No drainage should be used, but all bleeding points should be stopped, so as to prevent any accumulation of blood beneath the membrane, thus tending by its tension to tear the membrane from its attachments. If the membrane is so used it is an ideal absorbable substance which, owing to its thinness and pliability, can be readily adapted to any contour and yet, being absorbable, leaves no foreign body within the joint, which necessarily hampers the action of the normal motion of the joint.

From the experience gained in the preceding work there are certain lessons to be learned. Tuberculous cases, owing to the nature of the ankylosis, being generally fibrous in character, there is not the necessity for much modeling of bones. Care must be taken to be sure that all the tuberculous process is over, otherwise a tuberculous condition may be relighted. The fact, however, that the tuberculous condition has ceased is not always possible to determine.

Generally speaking, tuberculous joints of children should not be operated on. If the bony modeling is necessary one must necessarily interfere with the epiphyseal line and hence hinder future growth. It is wise, therefore, in tuberculous cases to defer operation until the epiphyseal ossification has taken place.

In cases of more acute inflammatory condition, as those due to the gonococcus, it is well to wait some time before operation. My own experience would make it one year after the acute onset of the disease before performing an arthroplasty. Thus will the thickness of the capsules and the adherence of the periarticular tissues be in a great measure reduced and so much difficulty will not then be met in the closure of the capsule (a point which is necessary in the making of a successful joint).

Chronic diseases, as arthritis deformans, which are still active though subacute, should be avoided.

After-Treatment. In a former communication I advised that early passive motion should be instituted. This I think was a mistake, and was accountable in a measure for some of my early poor results. The joint should be placed in plaster and kept absolutely quiet for at least three or four weeks. This will allow the physiological changes which are necessary to the formation of a joint to take place without fear of vitiating our results by tearing away the membrane from its attachments. After the plaster has been removed, passive motions should be instituted, followed, within a week, by active use. Massage, hydrotherapy, and mechanotherapy should then be instituted to increase the elasticity of the periarticular tissue. The after-treatment requires patience, skill, and pertinacity, and this should be thoroughly explained to the patients before operation and their coöperation secured before an arthroplasty is instituted.

Conclusions. A membrane arthroplasty is the best form of arthroplasty, as no foreign substance is left within the joint. Therefore there is no pain from any remaining interposed living tissue.

The operation itself is less extensive than a flap or muscle implantation and the periarticular tissues are less interfered with. There is no interference with the integrity of a normal part by the removal for a flap of any adjacent structures.

Less resection has to be made in order to interpose the intermediary substance.

In properly selected cases good, serviceable, painless motion can be obtained by a membrane arthroplasty in most joints, particularly in the jaw and in the hip-joint.

In the knee-joints, fibrous ankylosis of the entire joint or bony ankylosis of the femoropatellar articulation, give excellent results by this mode of arthroplasty.

In true bony ankylosis of the femorotibial joints the results are still unsatisfactory, but give hope of better results with a better consideration of the difficulties involved.

REPORT OF ARTHROPLASTY CASES. INSERTION OF BAER MEMBRANE.

No.	Case.	Sex.	Age.	Ankylosis.	Etiology.	Operation.	Result.
					TEMPOROMAXILLARY JOINT		
1	W. C.	M.	14 years	Bony	Scarlet fever	Right jaw, Nov., 1911; left jaw, June, 1911	Normal opening.
2	K.	F.	9 "	Bony	Scarlet fever	Feb., 1912	0.5 cm. opening.
3	H. M.	F.	3 "	Fibrous	Following throat examination	Nov. 10, 1915	Normal.
4	D. S.	F.	18 mos.	Fibrous	Congenital deformity	Left jaw, Jan. 21, 1914	Patient stood operation well.
						Right jaw, Dec. 7, 1914	Patient died under anesthetic.
5	D. S.	F.	12 years	Complete bony	Injury	Jan. 10, 1916	Normal.
6	P. S.	M.	7 "	Bony	Injury by forceps at birth	Jan. 15, 1916	Normal.
7	R. S.	F.	19 "	Bony	Fracture	Jan. 15, 1915	Normal.
8	E. T.	F.	30 "	Complete bony	Scarlet fever	Feb. 18, 1913	Normal.
9	J. B.	M.	10 "		Fracture	Feb. 14, 1917	Normal.
					HIP-JOINT.		
10	T. C.	M.	37 "	Complete bony	Gonorrheal arthritis	July, 1910	90 degrees motion.
11	L. C.	M.	23 "	Complete bony	Gonorrheal arthritis	May, 1911	20 degrees motion.
12	M. J.	M.	25 "	Complete bony	Gonorrheal arthritis	June, 1912	40 degrees motion.
13	T. S.	F.	36 "	Complete bony	Gonorrheal arthritis	May, 1913	60 degrees motion.
14	W. B.	F.	33 "	Complete bony	Gonorrheal arthritis	Mar. 17, 1916	100 degrees motion.
15	L. M.	F.	31 "	Complete bony	Gonorrheal arthritis	June 16, 1915	90 degrees motion.
16	L. M.	F.	31 "	Complete bony	Gonorrheal arthritis	Dec. 7, 1915	45 degrees motion.
17	M. N.	M.	22 "	Complete bony	Gonorrheal arthritis	Oct. 21, 1916	95 degrees motion.
18	F. L.	M.	31 "	Complete bony	Gonorrheal arthritis	Jan. 30, 1917	90 degrees motion.
19[1]	S. D.	F.	15 "	Complete bony	Tuberculosis	Jan., 1912	0 degree motion.
20[1]	G. H.	M.	20 "	Fibrous and bony	Tuberculosis	April 18, 1914	0 degree motion.
21[1]	F. J.	M.	19 "	Complete bony	Tuberculosis	Feb. 12, 1914	0 degree motion.
22[1]	T. Z.	F.	24 "	Bony	Tuberculosis	Feb. 19, 1914	0 degree motion.
23[1]	A. M.	F.	20 "	Bony	Tuberculosis	Sept. 29, 1914	0 degree motion.
24[1]	I. L.	M.	8 "	Bony	Tuberculosis	Nov. 21, 1913	0 degree motion.
25[1]	E. D.	F.	17 "	Fibrous	Tuberculosis	Sept. 20, 1916	0 degree motion.
26	M. L.	F.	19 "	Bony	Tuberculosis	Dec., 1910	30 degrees motion.
27	M. L.	F.	20 "	Bony	Tuberculosis	July, 1912	30 degrees motion.

28	V. B.	F.	12	"	Bony	Tuberculosis	July, 1911	30 degrees motion.
29	M. K.	F.	46	"	Fibrous	Tuberculosis	Nov. 19, 1914	45 degrees motion.
30	A. G.	M.	12	"	Fibrous	Tuberculosis	May 26, 1914	45 degrees motion.
31	L.	F.	16	"	Complete bony	Tuberculosis	Dec. 2, 1908	50 degrees motion.
32	S. B.	F.	17	"	Fibrous	Tuberculosis	June 12, 1916	50 degrees motion.
33	G. S.	M.	6½	"	Bony	Tuberculosis	Oct., 1907	75 degrees motion.
34	J. B.	M.	24	"	Bony	Tuberculosis	May, 1909	90 degrees motion.
35	M. T.	M.	21	"	Bony	Tuberculosis	Jan. 31, 1916	90 degrees motion.
36	T. F.	M.	55	"	Bony	Tuberculosis	Nov. 2, 1914	90 degrees motion.
37	C. S.	F.	24	"	Bony	Tuberculosis	July, 1910	90 degrees motion.
38	M. P.	F.	9	"	Part bony, mostly fibrous	Tuberculosis	Dec., 1910	100 degrees motion.
39	C. S.	F.	24	"	Complete bony	Tuberculosis	Mar. 8, 1910	110 degrees motion.
40	H. W.	F.	21	"	Complete bony	Infection	Dec. 6, 1916	75 degrees motion.
41	A. T.	F.	18	"	Complete bony	Infection	June 3, 1915	30 degrees motion.
42	G. B.	M.	33	"	Complete bony	Septic infection	Jan. 5, 1914	45 degrees motion.
43	M. L.	F.	38	"	Bony	Infection following childbirth	Dec., 1915	45 degrees motion.
44	M. C.	F.	43	"	Complete bony	Scarlet fever	Oct. 7, 1913	45 degrees motion.
45	R. M.	M.	25	"	Bony	Infection	Oct., 1911	45 degrees motion.
46	K. R.	M.	14	"	Bony	Septic infection	May, 1909	50 degrees motion.
47	F. K.	F.	47	"	Bony	Septic infection	Mar. 20, 1914	50 degrees motion.
48	M. C.	F.	43	"	Complete bony	Scarlet fever	Dec. 2, 1913	50 degrees motion.
49	J. S.	M.	49	"	Complete bony	Typhoid infection	May 20, 1911	70 degrees motion.
50	B. K.	F.	39	"	Complete bony	Infection	Jan., 1912	75 degrees motion.
51	J. S.	M.	49	"	Complete bony	Typhoid infection	April 10, 1911	90 degrees motion.
52	H. H.	F.	17	"	Bony	Infection	June, 1912	90 degrees motion.
53	T. M.	M.	25	"	Bony	Scarlet fever	July 14, 1914	90 degrees motion.
54	C. B.	M.	37	"	Bony	Infection	Dec. 18, 1916	90 degrees motion.
55	G. P.	M.	26	"	Complete bony	Arthritis deformans	July, 1910	0 degree motion.
56	J. T.	M.	20	"	Complete bony	Arthritis deformans	Feb. 12, 1915	0 degree motion.
57	M. T.	M.	51	"	Complete bony	Arthritis deformans	July, 1912	80 degrees motion.
58	O. E.	M.	27	"	Complete bony	Arthritis deformans	Sept., 1916	50 degrees motion.
59	J. S.	M.	33	"	Complete bony	Arthritis deformans	June 3, 1915	35 degrees motion.
						PHALANGEAL JOINT.		
60	B. L.	M.	32	years	Bony	Septic infection	Sept., 1910	60 degrees motion—part voluntary.
61	L. G.	M.	22	"	Complete bony	Septic infection	Oct., 1911	50 degrees motion—part voluntary.
62	R. H.	M.	33	"	Complete bony	Infection.	Mar., 1912	45 degrees motion—voluntary.

[1] In Cases 19 to 25, tuberculosis set up by operation and ankylosis recurred.

REPORT OF ARTHROPLASTY CASES. INSERTION OF BAER MEMBRANE.—*Continued.*

No.	Case.	Sex.	Age.	Ankylosis.	Etiology.	Operation.	Result.
					ELBOW-JOINT.		
63	A. S.	F.	26 "	Bony	Gonorrheal arthritis	Oct., 1911	0 degree motion—ankylosis recurred.
64	M. J.	M.	15 "	Complete bony	Infection	June 2, 1915	Death June 20, 1915—staphylococcus aureus infection.
65	G. R.	M.	10 "	Fibrous	Fracture	Jan. 24, 1915	25 degrees motion.
					RADIO-ULNAR JOINT.		
66	E. R.	F.	4½ "	Bony	Congenital synostosis	July, 1909	110 degrees motion.
67	B. C.	M.	28 "	Fibrous	Fracture	Jan., 1914	98 degrees motion.
					ASTRAGALOTIBIAL JOINT.		
68	G. C.	M.	25 years	Bony	Septic infection following gunshot wound	Mar., 1911	30 degrees motion.
					SHOULDER-JOINT.		
69	N. B.	F.	7 "	Fibrous	Infection	Sept. 5, 1914	Normal.
70	J. N.	M.	7 "	Bony	Tuberculosis	Nov. 8, 1914	No motion—tuberculosis set up by operation.
71	C. T.	F.	9 "	Fibrous	Tuberculosis	Mar. 22, 1916	No motion—tuberculosis set up by operation.
					TENDON SHEATH.		
72	J. K.	M.	37 years	Fibrous; tendons of extensor group were adherent	Old fracture—infection	Feb. 26, 1914	No result.
					KNEE-JOINT.		
73	L. K.	F.	22 "	Fibrous between patella and femur and fibrous between tibia and femur	Gonorrhea	Mar. 6, 1916	20 degrees motion.
74	A. D.	F.	14 "	Fibrous between patella and femur and fibrous between tibia and femur	Tuberculosis	Sept., 1910	20 degrees motion.
75	B. G.	F.	42 "	Fibrous between patella and femur and fibrous between tibia and femur	Tuberculosis	Sept. 18, 1913	50 degrees motion.
76	W. G.	M.	22 "	Fibrous between patella and femur and fibrous between tibia and femur	Tuberculosis	April, 1913	40 degrees motion.

77	M. B.	F.	14	"	Fibrous between patella and femur and fibrous between tibia and femur	Tuberculosis	Dec., 1908	75 degrees motion.
78	C. S.	M.	13	"	Fibrous between patella and femur and fibrous between tibia and femur	Tuberculosis	Nov., 1910	0 degree motion.
79	I. L.	M.	12	"	Fibrous between patella and femur and fibrous between tibia and femur	Tuberculosis	May, 1913	55 degrees motion.
80	A. G.	F.	27	"	Bony between patella and femur and fibrous between tibia and femur	Gonorrhea	Oct., 1909	75 degrees motion.
81	C. W.	M.	24	"	Bony between patella and femur and fibrous between tibia and femur	Gonorrhea	June, 1911	110 degrees motion.
82	M. P.	F.	23	"	Bony between patella and femur and fibrous between tibia and femur	Infection	Oct., 1912	40 degrees motion.
83	W. G.	F.	17	"	Bony between patella and femur and fibrous between tibia and femur	Tuberculosis	July 6, 1914	55 degrees motion.
84	E. W.	F.	26	"	Bony between patella and femur and fibrous between tibia and femur	Infection	Dec. 31, 1914	50 degrees motion.
85	E. F.	F.	35	"	Bony between patella and femur and bony between tibia and femur	Gonorrhea	Jan., 1910	0 degree motion.
86	R. C.	M.	24	"	Bony between patella and femur and bony between tibia and femur	Gonorrhea	July, 1911	0 degree motion.
87	B. F.	F.	25	"	Bony between patella and femur and bony between tibia and femur	Infection	July, 1912	0 degree motion.
88	W. H.	M.	23	"	Bony between patella and femur and bony between tibia and femur	Gonorrhea	Oct., 1912	0 degree motion.

REPORT OF ARTHROPLASTY CASES. INSERTION OF BAER MEMBRANE.—*Continued.*

No.	Case.	Sex.	Age.	Ankylosis.	Etiology.	Operation.	Result.
					KNEE JOINT—*Continued.*		
89	At Liver pool	M.	30 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	Sept., 1911	0 degree motion.
90	L. S.	F.	22 "	Bony between patella and femur and bony between tibia and femur	Fracture	June 26, 1914	0 degree motion.
91	M. T.	F.	19 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	Dec. 1913	0 degrees motion.
92	H. L.	F.	34 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	Jan., 1910	20 degrees motion.
93	C. B.	F.	26 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	Jan., 1910	20 degrees motion.
94	C. B.	F.	30 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	May, 1911	20 degrees motion.
95	C. N.	M.	30 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	Sept., 1911	20 degrees motion.
96	J. W.	M.	40 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	May 23, 1914	20 degrees motion.
97	F. C.	M.	23 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	Dec. 11, 1914	20 degrees motion.
98	B. L.	F.	28 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	Sept., 1912	30 degrees motion.
99	B. T.	F.	18 "	Bony between patella and femur and bony between tibia and femur	Injury	May 19, 1915	30 degrees motion.
100	D. S.	M.	20 "	Bony between patella and femur and bony between tibia and femur	Gonorrhea	April, 1909	45 degrees motion.

COMPLETE BONY ANKYLOSIS OF THE JAW. REPORT OF THREE CASES CURED BY OPERATION

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Though long aware that bony ankylosis of the mandible sometimes occurs in parrots and rodents, I had never heard of such an occurrence in a human being until about three years ago, when I saw in consultation a child with congenital fusion of the alveolar processes of the upper and lower jaws. There was a history of two previous children of the same parents having died of starvation from the same cause.

I was therefore considerably surprised when I saw my first adult case, an Italian, with complete bony ankylosis on both sides which had existed for twenty-five years, and was the result of a fall on the chin when he was twelve years old. For five years there had been absolute immobility of the jaw. Previous to that there had been very slight motion, but not enough to get food into his mouth, except through a gap made by extracting two upper incisors. He had been, he said, in several hospitals in Europe and in this country, but was told that nothing could be done. He was extremely anxious to be operated upon, and said he hoped I would either cure or kill him, as he was tired of living in that condition. With this *carte blanche* permission I determined to attempt the operation, though I was not then aware that such an operation had

ever been done, and was in complete ignorance of the splendid work our late lamented confrère, Dr. Murphy, had done for such cases. Accordingly, I operated upon him at the Emergency Hospital July 26, 1915, and the result was most gratifying both to me and to the patient. Now after eighteen months he can separate his teeth an inch and a quarter, says he can "chew spigetti and chew tobac'," and is happy.

A few months later my second case came to me from having heard of the first. The condition was similar, but skiagrams showed it to be confined to one side. There had been complete immobility for twenty-two years, also caused by a fall on the chin in childhood, and the patient, a very intelligent young man of twenty-six years, was rather skeptical, as he told me he had twice been in the Johns Hopkins Hospital, where unsuccessful attempts had been made to force the opening under anesthesia. I operated upon him in the Emergency Hospital February 20, 1916, and he is one of the most pleased and grateful patients I have ever had. He says one cannot imagine the relief it is just to get his tongue out between his teeth and to be able to eat as other people do. He gained twenty-five pounds in weight in a few months after the operation, and I was afraid for a while that he would do himself more harm by overeating than had been caused by the ankylosis.

The third case is a young lady who came to Dr. A. R. Shands with complete bony ankylosis of eighteen years' duration caused by middle ear disease.

On account of my experience with the two previous cases Dr. Shands asked me to assist him in the operation, and kindly gave me permission to report it in this paper. We operated upon her at the Emergency Hospital September 14, 1916.

The result in this case has also been very gratifying, though sufficient time has not elapsed to be sure the relief

is permanent. The operation which I improvised in my cases is in most respects similar to that perfected by Dr. Murphy, and well described by Krenscher in the *Interstate Medical Journal,* October, 1916. I am sorry I had not seen it when I operated, for Murphy's operation is an improvement on mine, and his periosteotome retractors are better than the instruments I used in a similar way. But I am glad that I was able to solve the problem for myself in a way that proved efficient, and in my ignorance I have shown, I think, that it is not really necessary to interpose fat or fascia between the divided bone surfaces, provided they are well separated and a rather pointed articular end cut on the ramus as shown in Fig. 1.

I did attempt to cover the cut surfaces of bone with periosteum, but in only one of four operations upon the three patients was this really done in a manner at all satisfactory. And yet sufficient time has elapsed, I think, in the first two cases to show that the results will be permanent, especially as improvement is still going on.

The greatest difficulty in these cases was in overcoming the contraction of the masseter and internal pterygoid muscles. After section of the bones the jaws were still quite rigid until this muscular contraction was gradually overcome by the use of lead expansion screws and small dental jack screws placed between the molar teeth. This may have been due to the long duration of the ankylosis. The condition shown in all three cases is very well shown in Fig. 2. There was absolutely no line of demarcation between the mandible, zygoma, and base of the skull, and the bone was astonishingly thick and hard. The ramus of the jaw at the point of division was never less than half an inch thick and an inch and a quarter wide, and in one instance was three-quarters of an inch thick by one and one-half inches in width, and in all cases was hard as ivory, with no cancellous tissue in the central portion.

In one case the internal maxillary artery was cut, but the bleeding was controlled temporarily by packing with gauze until we had finished cutting away the bone, as shown in the dotted line on Fig. 1. I was then able to pass a catgut suture under the artery with a small curved needle and tie it. My most serious difficulty came from cutting the parotid gland. This accident occurred in three of the four operations, although special care was taken to avoid it. Normally the parotid lies behind the ramus, but in all these cases it overlapped the bone, coming in the last case over the ramus as far as the midline of the bone. In each instance a small portion of it was cut off with the first incision.

The result was a salivary fistula which persisted for several weeks, and although this did not affect the end result it caused considerable annoyance. There was no evidence of facial paralysis in any of my cases. Even in several patients in whom I have removed the whole parotid gland for tumor there has been only a slight and temporary paralysis of the face. It is difficult to understand this, for the main trunk of the facial nerve usually divides in the substance of the gland into temporofacial and cervicofacial branches.

With Murphy's incision the danger of cutting into the parotid is lessened; but care should still be taken to avoid it by keeping close to the bone in freeing it for division.

If I ever have occasion to perform this operation again I shall certainly use his method, though I think I should make the transverse portion of the incision a half-inch lower, so that it will correspond to the lower instead of the upper border of the zygoma.

His periosteotome retractors are ideal for retracting and protecting the soft tissues during division of the bone, and, as Krenscher says, are the key to safety and ease in doing the operation.

I am also of the opinion that his method of obtaining and interposing a flap of temporal fascia between the raw bone surfaces is an additional safeguard against failure, provided it is protected from pressure by a wedge between the molar teeth of the affected side. While not absolutely necessary it may increase the range of motion and lessen the chances of recurrence of the ankylosis. I think it is very important that this flap should be protected from pressure, as he has indicated.

I am decidedly opposed to the interposition of any extraneous substance, whether of metal or animal membrane, for while the operation may be successful in spite of such things, they are useless and invite disaster. I agree entirely with Dr. Murphy that hand chisels and instruments are better than motor-driven drills or saws for cutting the bone; but I am opposed to the use of a hammer and chisel on any part of the skull, and particularly in the neighborhood of the maxillary articulation and mastoid. I think I have seen severe and even fatal shock produced in this way. I found my cranial drill (see Fig. 6) very useful for boring a row of holes across the bone, after which a small rongeur and gouge chisel, used without hammering, easily completed the work. I have long ago given up hammering in mastoid operations, and find this cranial drill extremely useful.

In conclusion, I would say that this operation is not as easy and simple as it might seem at first sight. There are many important structures in the immediate neighborhood of the articulation, among which are the facial nerve, facial internal maxillary and carotid vessels, carotid gland and Stenson's duct, and the depth, thickness, and hardness of the bone will be a surprise to any one doing it for the first time. Carefully done, however, it is safe and not really difficult, and result really brilliant.

I know no operation which gives a greater relief and satisfaction to the patient.

Appended is a cut and description of the cranial drill I had made for me by Knyscheerer, and the histories of the three cases referred to above. (Fig. 3.)

Case I.—I. E., male, Italian, aged thirty-seven years. Admitted to the Emergency Hospital July 26, 1915.

Previous History. When about twelve years old he had a fall, striking his chin and injuring his jaw. Since that time he has been unable to open his mouth or chew solid food. Until five years ago there has been very slight movement in the joint; but he was able to eat only by putting food in through a gap where two incisor teeth had been removed and mashing it with his tongue against the roof of his mouth. But for the last five years there has been no motion at all of the jaw.

Present Condition. Rather small man, fairly well nourished, and normal in all respects except the absolute rigidity of the jaw and the retracted chin, which always follows injury to the neck and head of the mandible. He is extremely anxious to have an operation done for his relief. Says he would rather be killed than live in his present condition. Radiographs showed a massive bony ankylosis of both sides.

Operation. July 28, 1915. A vertical incision was made half-inch in front of the auditory mealus, extending from the upper border of the zygoma downward about an inch and a half. From the upper angle the incision was carried transversely across the cheek for an inch and a quarter. The bone was exposed, care being taken to avoid the parotid gland and Stenson's duct. It was impossible to find any line of demarcation between the ramus and the zygoma or base of the skull. The ramus was an inch and a half wide, and was finally exposed low enough down to find a free edge anteriorly and posteriorly; a flexible retractor was then inserted under the ramus, and it was cut away with gouge chisels without hammering, and pointed

at the articular side somewhat like the normal head and neck. A flap of periosteum was turned down from the zygoma and inserted between the cut bone surfaces. The same operation was then done on the other side; but a piece of the parotid gland was cut off, and the internal maxillary artery wounded by a slight slip of the chisel. Bleeding controlled temporarily by gauze packing, and after the bone had been cut away the artery was tied by passing catgut in a small curved needle under it. Periosteum was so thin over the zygoma that no satisfactory flap could be obtained. The wounds were closed and the jaw found slightly movable, but still quite rigid on account of muscular contraction. Attempting to pry open the teeth resulted in knocking out three or four before it was found that they were extremely loose from disuse and shelled off as easily as grains of corn from a cob. Finally, a mouth gag was got in between two pretty firm molars and an inch cork put in between the jaws in front.

Next day this cork was removed and it was found that the patient could open and close his jaw to the extent of about half an inch. Later, by the use of gradual dilatation with ordinary lead expansion screws, such as are used by carpenters, the range of motion was increased to one inch, and when last seen, sixteen months after the operation, the range was one and one-quarter inches.

Cutting the parotid gland caused a salivary fistula on one side which did not completely heal for seven weeks, but otherwise convalescence was normal, and the scars, when last seen, were hardly noticeable.

Case II.—D. D., white male, single, aged twenty-two years. Admitted to the Emergency Hospital February 12, 1916.

Previous History. When about ten years old he fell from a cherry tree, striking on the chin. After recovery from the acute injury the jaw was very stiff and sore, and

this rigidity increased until he was unable to eat. A year or so later he was taken to a hospital where the jaw was opened forcibly under an anesthetic. This gave temporary relief, but in a few months the condition was worse than before. Several years later he was again taken to the same hospital and another attempt made to break up the ankylosis by forcible dilatation under ether. This time the attempt was not successful and several teeth were knocked out in the attempt to pry open the jaw. After that there was complete immobility. Eating, as in the previous case, was accomplished by introducing food through a space left by the loss of an incisor tooth and masticating with the tongue.

Condition on Admission. Tall, slender, very intelligent young man, with the usual receding chin and complete immobility of the jaw. He was pale, not very well nourished, and very sensitive about his condition. An excellent series of skiagrams was made by Dr. Thomas A. Groover, showing the usual bony mass about the mandibular articulation on the right side, but the left articulation seemed nearly normal. The chin was drawn slightly toward the affected side and the cheek on that side was fuller and more rounded. This corresponds to Dr. Murphy's observation that the best-looking side is the affected one in unilateral cases. This is due to the shortening of the ramus at the point of fracture, or disease, and the inhibited development of the bone that results. He had several badly decayed teeth, but had never had toothache.

Operation an hour after admission, February 12, was similar in all respects to that described in Case I, except that it was done on the right side only, and without accident of any kind except cutting off a small piece of the parotid. The operation was much facilitated by passing the curved handle of a bone forceps behind the ramus, first on one side and then on the other, and boring out the bone

FIG. 1 FIG. 2 FIG. 3

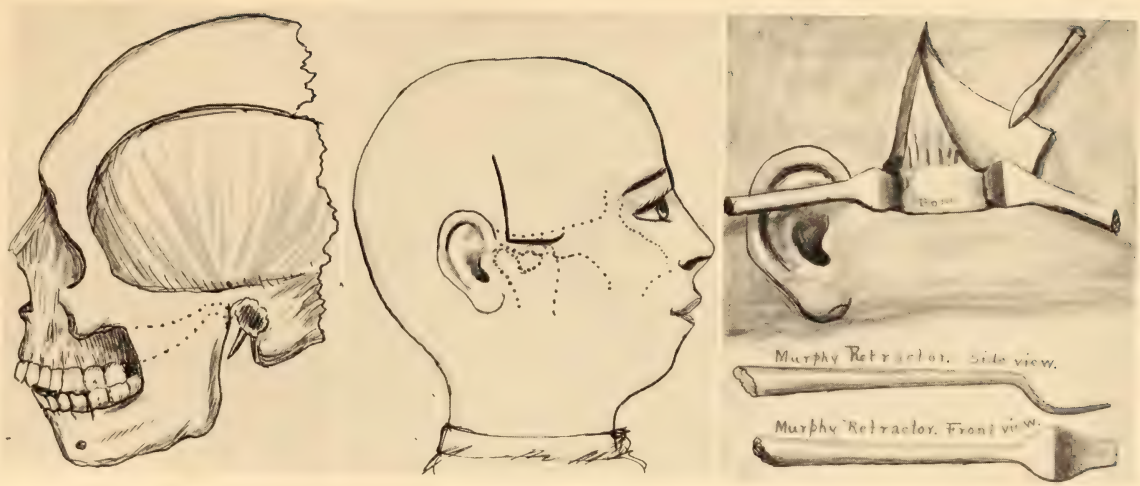

FIG. 1.—Notice the smooth, complete bony ankylosis. Bone between dotted lines to be cut away.

FIG. 2.—Showing condition found in author's three cases.

FIG. 3.—Incision completed, exposing bone and showing retractors in position. Below Murphy's retractor, side and front views.

FIG. 4.—Carr's cranial bone drill or trephine is used for making an osteoplastic flap of the skull in brain surgery. By means of the drill several holes are made, to be afterward connected by cutting away the intervening spaces with the rongeur forceps of a Gigli wire saw. The drill cuts a hole five-sixteenths inch in diameter very rapidly and safely. It is furnished with a guard by which the depth of the cut can be regulated, obviating all danger of cutting into the dura. This instrument has several advantages over other instruments for opening the skull. It cuts more easily and quickly, requiring less pressure and force, and cuts a clean hole just large enough to admit the rongeur forceps, which is all that is needed. Three or four holes can be bored in a triangle or square and connected in a few minutes, or a large osteoplastic flap made in the same way.

with my cranial drill. No flap was interposed, but the articulating end of the ramus was cut to a rounding point. After section of the right side of the jaw was found movable and pried open about an inch, very carefully with a pair of Goodell uterine dilators, one on either side between the molar teeth. This was done to stretch the muscles which were much contracted.

After-treatment. There was no special after-treatment for a week. Then I turned the patient over to my dentist, Dr. A. B. Cooper, who gave him the expansion screws and, later, small dental jack screws and taught him how to use them himself, and tighten them up a little more each day as the muscles relaxed. He wore them mainly at night, with a silk thread attached to prevent swallowing them during sleep, and at the end of three weeks could open and close his mouth without discomfort, almost to a normal degree. The range of motion is now an inch and a quarter, and the patient has had a new set of teeth to replace those that were knocked out and several that were later extracted for decay. The wound healed readily except for a small salivary fistula which persisted for six weeks, but did not necessitate confinement. The patient sat up on the third day and was comfortable, and was discharged from the hospital on the tenth day after operation. He is now well, eating without difficulty and about the most pleased patient I have ever had.

Case III.—D. J., female, white, aged twenty-two years, single. Patient of Dr. A. R. Shands. Admitted to the Emergency Hospital September 14, 1916.

Previous History. Had acute suppuration of the middle ear following measles when four years old. The ear drum burst and drained for some weeks and was followed by soreness and stiffness of the jaw, which finally became fixed, and has remained so for eighteen years.

Condition on Admission. A very intelligent young lady, of medium size, well nourished, but with soft muscles.

No teeth had been lost, but the lower jaw was so much retracted that the lower incisors were half an inch back of the upper incisors, leaving a gap through which food was introduced. Jaw absolutely rigid. Chin drawn slightly to right side and right cheek fuller than left. Skiagrams made by Dr. Groover showed heavy mass of bone about the right mandibular articulation and left joint apparently normal.

Operation. September 15 by Dr. Shands with my assistance. Dr. Shands attempted to operate through a straight transverse incision over the zygoma, but was obliged to make an L running down half inch in front of the ear in order to get sufficient room. The bone was cut, as in the previous cases, with a cranial drill and gouge chisel without hammering and trimmed with bone forceps. Immediately on section of the bone there was a wide separation and the mouth opened easily an inch and a half. A small piece of parotid gland was cut off in spite of our care to avoid it. No flap used between cut bone surfaces.

After-treatment. No special after-treatment was used. The muscles were not contracted as in the previous cases, and the young lady was able to eat in a few days without discomfort. The wound healed readily except for a small salivary fistula, which had almost entirely healed when she returned to her home in North Carolina about November 1, 1916.

I advised Dr. Shands to teach her the use of the expansion screws and have her use them on the slightest sign of recurrence, but so far it has not been considered necessary.

DISCUSSION ON THE PAPERS OF DRS. BAER AND CARR

Dr. William R. Jackson, Mobile, Alabama.—I have enjoyed both of these papers very much indeed, and I rise merely to ask a few questions about the technic.

I would like to ask Dr. Baer (1) how large a section of the bone he removed in taking out the condyle of the inferior maxilla, and how he can tell which side was ankylosed clinically without his *x*-ray picture? (2) does he in the larger joints of the extremity make any traction at all? (3) when does he begin passive motion? We know that fascia and fat and muscular flaps interposed between the articular surfaces of bone during arthroplasty maintain their vitality, provided we exercise the necessary traction to prevent impingement upon the flap during its vascularization. It is very necessary to have vascularization of a flap to have permanency of mobility in arthroplasty. I suppose that this thin delicate tissue, while it acts as a scaffold for cell proliferation of the endothelial cells, for the articular surfaces of the joints and adjacent tissue, will soon become absorbed and we have a fibrous ankylosis just as at first.

I am very much pleased that the experience of Dr. Baer proves to the contrary.

Dr. George Tully Vaughan, Washington, D. C.—I would like to ask the doctor what precautions he took to avoid the facial nerve? He can avoid the main trunk, but I refer to the branches that run across the zygoma in the temporal region.

I am certainly very much pleased to have heard his paper on this subject; I think it is a valuable contribution, and I want to congratulate him on his success.

Dr. V. P. Blair, St. Louis, Missouri.—Not all limitations of movement, clinical ankylosis of the jaw, are from the same cause. In many cases there is much peri-articular damage. With the subject of ankylosis of the jaw must be considered peri-articular exostosis; bony impingement at the angle of the jaw; scars in the cheek, in the temporal, masseter or internal pterygoid muscles—conditions that are not to be corrected by the simple linear cut and the insertion of a membrane.

Double ankylosis, for a time, presented a special theoretical difficulty to me. On theoretical grounds I believed that after removing both condyles for a double ankylosis the action of the mandible would be changed from that of a lever of the second kind with the power (masseter, temporal and internal pterygoid muscles) applied between the load (the chin drawn down by the suprahyoid muscles) and the fulcrum (the condyle), to a lever of the first kind. Removal of the normal fulcrum (the condyles) should, according to my reasoning, place the fulcrum at the last occluding molar teeth with the power posteriorly, as the

result of which a muscular effort to close the mouth causes firm closure at one point, between the last occluding molars, with an up-tilting at the angle and a corresponding opening in front. Fortunately this does not follow the removal of both condyles —why, I cannot explain.

In any case where there has been an ankylosis during the growth period the chin will be retracted. The retraction is due largely to a lack of growth in the length of the rami, chiefly on the ankylosed side. This causes the chin to also deviate to the ankylosed side.

It is our custom, when doing a resection of the joint for a single ankylosis, to cut the ramus in two on the opposite side with a wire saw and drag the body of the jaw forward as far as possible and wire the teeth together in this position. When a double resection of the joint is made it is not necessary to cut the ramus. Later the orthodontist rearranges the occlusion of the teeth and sometimes we implant a costal cartilage in front of the chin part of the mandible to round out the mental eminence. Orthodonture alone, without the forceful forward movement of the body of the jaw at the time of operation, will not give as good a result.

DR. BAER (closing on his part).—As to how much resection should be made in the condyle of the jaw, personally I would prefer to take off just as little as possible, as I do in all joint resections, to leave the joint as near perfect as possible. That is the reason why I used animal membrane. You can take off a small piece without doing entire resection of the coronoid process and condyle unless absolutely ankylosed. If they are ankylosed, take off just as little as you can to get in between the bone. The less you take off, the better function you have, and that is one of the reasons people open their jaws freely

In regard to facial paralysis, I will say to Dr. Vaughan that I have had three cases in which there was a certain amount of temporary facial paralysis. I try to make a very small incision underneath the zygoma. The incision in these cases is not more than three-quarters of an inch long. The tissues are retracted. These paralyses of the supra-orbital branch of the general facial nerve due to the traction of the retractor itself, have all cleared up except in one case. In this one case we still have a slight paralysis from it. Notwithstanding all the care we may exercise, we do get facial paralysis in certain cases from the pulling incident to the use of retractors.

In reply to Dr. Jackson's question, not only in jaw cases but in cases of hip disease and knee disease, patients are kept quiet for at least four weeks so that union can take place from solid bone by vascularization. The connective-tissue cells may become flattened. I do not think the endothelial cells have anything to with it. We do not form endothelial cells in arthroplasty. We do not have endothelial cells to begin with, because the joint is all gone, and as soon as the joint is gone the endothelial cells likewise have gone.

As to how I tell whether the jaw is ankylosed and which side it is, that is a pertinent question. The *x*-ray picture will not tell you at all. I have never seen an *x*-ray picture which would tell me which one was or which one was not ankylosed. It is purely clinical. With ankylosis neither jaw will move. You can tell the difference between a jaw that is ankylosed from one that is not by clinical observation and careful study of your cases, but you cannot tell it by means of the *x*-ray picture.

Dr. Carr (closing).—Just one word about the *x*-ray picture. In two of my cases we could see the joints plainly on both sides and could see that one side was sound; but there is a better way to tell the affected side. The chin is drawn toward the affected side when there is unilateral ankylosis.

I do not fear facial paralysis: In every one of the cases I operated on, the bone was an inch and a quarter or an inch and a half wide. There was much callus, and no sigmoid notch or any sign of demarcation between jaw and skull. I made an L-shaped incision an inch and a half long over the lower border of the zygoma and down for an inch, along the posterior border of the ramus. There was no facial paralysis perceptible in any of these cases. In several cases in which I have taken out the parotid gland entirely, there was only temporary facial paralysis —though this seems impossible.

I have an orderly at the hospital now on whom I operated a number of years ago, removing his entire parotid gland. For some months his face was paralyzed, but there is no sign of it now. I cannot explain it. But I do not think we need so much to fear facial paralysis.

A PROPOSED OPERATION FOR PROLAPSE AND RETRODISPLACEMENT OF THE UTERUS

By John T. Moore, A.M., M.D., F.A.C.S.
Houston, Texas

In proposing an operation for prolapse and retrodisplacement of the uterus, I do so with some degree of hesitation, as there have been so many set forth at different times by various operators of great skill.

The operation that I present is, so far as I know, different from any yet described, in that it makes use of the fascia as a fixative structure, or, as Dr. Howard Kelly says, "suspending structure" (personal communication).

I would have it understood from the outset that this operation is intended to provide a firm, yet movable, fixation or suspension in women who are not to bear children. It is also understood, of course, that the uterus is not so diseased as to contra-indicate its preservation and utilization in carrying out the plan of repairing a pelvic hernia in the case of a prolapse.

While it might be possible for a woman to bear a child after this operation, and without trouble, yet I would select other methods that are less liable to subject her to the danger of a complicated labor.

Ventral fixation of the uterus as ordinarily done is said to have been proposed first by Olshausen, of Berlin, and Howard Kelly, of Baltimore, in 1885. They firmly sewed the fundus of the uterus to the thin posterior fascia and

peritoneum of the lower abdominal wall. This in most cases amounted only to a suspension operation.

In this proposed operation a median incision is made four to five inches in length just over the pubis as in any laparotomy.

One should now make a close survey of the organs in the abdominal cavity and do such things as are indicated before taking any further steps. Having done all that is necessary to be done, one is ready to proceed.

The fat is now retracted and the fascia freed from the fat as far outward on either side as is necessary for a fascial flap of about one-half an inch in width.

Now cut a strip of fascia about a half inch wide and three or four inches long, with the base or attachment toward the pubis, planning to stop the flap at a point which would bring the uterus to take a normal position of anteversion. After the flap is cut a catgut or other ligature is put into each end of the fascia to be used, as a convenient carrier. Figs. 1 and 2.

An incision is now made in the fascia of the rectus, about three-quarters of an inch outward from the bases of the flaps, as shown in Fig. 3. An ordinary curved clamp is now passed through this short incision of the fascia, pushed through the rectus muscle and its posterior sheath and the peritoneum, carrying the ligature, which was put into the end of the fascia, with it; the fascial strips are now drawn through from without in, as shown in Fig. 3. Now, with a volsellum forceps we catch the uterus in the fundus just posterior to a line between the tubes. A shallow incision is made into the uterus just anterior and internal to the round ligaments. These mark the entrance and exit of the needle which is to carry the strips of fascia.

I use a large, slightly curved ligature carrier, but a slender forcep does almost as well. Having threaded the liga-

ture of the right side we push the carrier or forceps through the wall of the uterus, taking pains to go about midway between the uterine cavity and the surface, entering at the incised point on the right and passing out at the corresponding point on the left side of the uterus. This ligature is now taken out and the one on the left strip of fascia threaded into the needle. By withdrawing the needle the ligature is brought to the opposite side. Each fascial strip is carried through in this way and the overlapping ends sewed by fine chromic twenty-day catgut to the opposite flap (Figs. 4 and 5).

Now, as the peritoneum is closed the uterus is sewed to the peritoneum, taking care to attach the round ligaments and the ovarian ligaments to the peritoneum, as done by Olshausen, Kelly, and Vineburg (Fig. 6).

In most cases of retrodisplacement or in prolapse it is sometimes important that the uterosacral ligaments be shortened so as to carry the cervix well backward. In case of a very long cervix it ought to be amputated.

In nearly all cases of prolapse there is a cystocele and rectocele which ought to be thoroughly repaired. The perineum also must be anatomically and well repaired where it is torn or too much relaxed.

When there is a cystocele requiring correction it is better to do the vaginal work first. Ordinarily I prefer to do the abdominal work first as one is able to secure a little better technic.

No claim of superiority is claimed, as the operation is presented for your consideration and trial. It is believed, however, that it is a competitor of the interposition operation of Watkins, Schauta and Wertheim.

It is thought to be a surer fixation or suspension than the Olshausen, Kelly or Vineberg operations, as the fascial strips will hold permanently, fascia being a permanent holding structure.

We feel that it is better than the implantation operations of Harris, Kocher or Murphy, as the uterus is kept within the abdomen and in a more normal position.

In our Case No. 10 the fascial flaps were cut longer, and after placing them through the uterus the broad ligament was pierced just anterior to the round ligament and the fascial flap was carried through and sutured posteriorly to the cervical segments, the idea being to counteract any tendency toward lengthening out of the cervical segment which might allow the cervix and vagina to come down.

The only mention I have found of the use of fascia as a supporting structure for the uterus was that by Slaughter, in 1913, when he used fascial strips alongside of the round ligaments where they were weak and underdeveloped.

I have done this operation now thirteen times. The first on April 15, 1915. All the cases have done well, and all have been accomplished by the operation that any fixation or suspension could. The patients are comfortable and well.

We had one death through peritonitis, which seemed to have occurred from clearing up adhesions about the ileum, Lane's kink. We are at a loss to account for this, as no injury to the intestines occurred. Postmortem, however, showed infection from this point. There was no infection about the site of operation upon the uterus.

DISCUSSION

Dr. Reuben Peterson, Ann Arbor, Michigan.—Inasmuch as we are fortunate in having with us today as a guest, Doctor Watkins, to whom we owe so much for his excellent plastic work, and who has devised an operation of inestimable value in just this class of cases, I would suggest that Doctor Watkins be asked to discuss this paper.

Dr. Thomas J. Watkins, Chicago.—Dr. Moore's operation is excellent as a suspension operation. "Suspensory ligaments"

would not be as prone to result as with other suspension operations and subject the patient to the dangers of serious internal intestinal hernias.

Personally no suspension or fixation operation appeals to me as a logical procedure for the treatment of prolapse of the bladder or uterus. No one would consider seriously suspension operations or plastic procedures for the cure of inguinal hernia but would insist upon closure of the opening through which the viscus protruded. The same principles apply largely in the operative treatment of prolapse of the bladder and uterus. Cystocele and uterine prolapse are hernias and should be treated as such. The transposition with which my name has been associated is a certain cure for cystocele as it permanently closes the opening through which the bladder herniates. It is limited in its use to patients beyond the child bearing period. The certainties of the result is different as regards the prolapse of the uterus as the opening through which the uterus herniates cannot be closed without obliteration of the vaginal canal. The anteposition in which the uterus is placed and the consequent twisting of the broad ligaments, which shortens them, insures permanent cure of the uterine prolapse except in case of extensive elongation of the broad ligaments. Modification of the operation is necessary when the uterus is very large or the broad ligaments extensively elongated as in complete procidentia. In the former instance part of the uterus should be excised. The amount removed should vary with each individual case to the extent of leaving only enough of the posterior wall of the cervix and lower uterine body to fill the hernial opening and to support the bladder.

The excessively elongated broad ligaments are efficiently remedied by excising portions of the ligament from the cervix on either side and by firm suture of the cut ends together anteriorly to the cervix. This operation comes into competition with the vaginal hysterectomy of Goffe and Mayo. Equally good primary results are obtained with the transposition or hysterectomy operation. The transposition operation must give better permanent results because the line of union in the case of hysterectomy is subjected to more tension and consequently much more liable to stretch and cystocele to recur than with the transposition operation.

In case of suppuration, of which there is always some danger, with extensive traumatic operations in the vagina recurrence

of the prolapse is certain after hysterectomy, and seldom, if ever, after the transposition. Recurrence of prolapse after hysterectomy necessitates obliteration of the vaginal canal; recurrence of prolapse after the transposition is safely and easily remedied by plastic surgery—by excising some of the uterine tissue and by uniting the broad ligaments in front of the cervix as described.

Dr. William R. Jackson, Mobile, Alabama.—I would like to criticize this operation. Practically this fascia is evanescent, cut off, having a pedicle there with very little vascularity. The pedicle at the lowest portion toward the symphysis is threaded through the round ligaments, sutured and tied and twisted around and all circulation is cut off. Therefore, it is soon absorbed, and there would be no suspending or holding up of uterus when the ligament is absorbed. Second, there would be some trouble in closing the abdominal wall and the cosmetics of the closure would not be very good.

Dr. V. P. Blair, St. Louis, Missouri.—I would like to say that Dr. Jackson's idea is not exactly in accord with our findings in the transplantation of fascia cutting off its circulation entirely and in closing large hernias.

Dr. Charles L. Bonifield, Cincinnati, Ohio.—In regard to the operation described by Dr. Moore, I think it is very ingenious and I have no doubt it answers the purpose admirably well, but after a good deal of experience in this sort of work, I should say that the cases must be very rare indeed where it is necessary to do so complicated an operation, and that a simpler method will answer the purpose in 99 out of 100 cases.

The operation I have done for years, and with universal satisfaction, and if I have had a real fa lure I do not know it, has been a combination of well known operations used in child-bearing women. I have used the Gilliam operation on the round ligaments, the Stone operation on the anterior vaginal wall, and that is very important and a colporrhaphy on the posterior. Dr. Watkins has emphasized the fact that in doing an operation on the anterior vaginal wall we must not only deal with the mucous membrane but with the entire vaginal wall.

Dr. Moore in reading his paper spoke of the uterus becoming elongated and pulled out. If that is the case, it is pulled from below by the anterior or posterior vaginal wall. If you do the Stone operation, which separates the bladder from the vaginal

wall, and lifts it up on the uterus and attaches it about the level of the internal os, the traction will be not on the cervix, but on the uterus above it. It will pull the uterus orward and anteflex it and anteflexion is one of the greatest means of preventing a prolapse. Then on the posterior wall it is necessary to do a thorough perineorrhaphy, and one of the reasons that so many operators have difficulty in these cases is that the perineorrhaphy is not done thoroughly enough to take care of the rectocele. Every time the woman defecates there is pull of the posterior wall of the cervix which will elongate the cervix, but in the great majority of cases certainly, either by the Gilliam operation or by the old ventrofixation, which is infinitely simpler, the woman can be given absolute relief. A fundamental principle to bear in mind is this: a uterus prolapses from one or two causes, and usually both. In the first place, from increase in weight; second, loss of support. If you only try to remedy or remove one of these causes you will not get a permanent cure. If you do something to reduce the weight of the uterus, amputate the cervix, or curette, and keep the patient in bed until you get involution, and apply supports equal to the task in the beginning you will get a permanent result.

I wish to repeat, that while the operation Dr. Moore has described is ingenious, and it is a good one, I think it is more complicated than is necessary in the vast majority of cases. I would like to hear from Dr. Ill on this subject who has had a large experience in dealing with these cases.

Dr Edward J. Ill, Newark, New Jersey —There is no one method that will cure all these cases. We have to study every case by itself and use that method which suits the particular case.

Some years ago I reported a series of 880 cases in which I resorted to a modified Gilliam operation, fastening the round ligament to the posterior surface of the anterior sheath of the rectus muscles. Of these 880 cases, we have had 6 relapses, which is less than 1 per cent. I know of no other operation that will do the same thing in the ordinary cases.

As Dr. Bonifield says, when it comes to cystoceles and moderate prolapses, I do not know of anything that helps me so much as Dr. Watkins' operation, nor do I know of anything that has given me so much satisfaction. We owe Dr. Watkins a debt of thanks for his beautiful exposition of that particular work.

Dr. Moore (closing).—Just a word or two in closing the discussion. The remarks of the various gentlemen have interested me very much. In undertaking to do anything in surgery we must understand, in the first place, what structures are for. The surgeon who undertakes to do all sorts of things without knowing embryology and the use of tissues cannot expect to do very much scientifically. Fascia is a supportive structure. It is intended to hold and not to lengthen out or spread out very much, but to hold on, and fascia that is in use will hold on and not atrophy, whereas fascia that is not used will atrophy. That fascia is supporting something.

In reference to Dr. Jackson's criticism, I will say that you can cut strips loose and transplant them without any fear at all; they will live. You can cut them off and sew them in any way you like. The blood supply is sufficient to keep them alive right straight along because, as we all know, the bloodvessels of fascia are not numerous, but they are supplied in a different way from that of muscle.

With reference to the intestine getting in behind, you may remember we called attention to the plan of sewing the round ligament on either side at the point where the fascia had come out and then sweeping a row of sutures right along the peritoneum just as we start to close up, so that nothing gets down over the fundus of the uterus, and there is no injury except where you may push in between the bladder and the fundus.

I am glad to hear the remark made by Dr. Watkins. I think Dr. Watkins operation is one of the best where we have complete prolapsus and the bladder coming far down, and I would like the doctor to take up and consider this feature and use it. It changes the whole plan of the bladder and its position to the uterus. It brings it out over the uterus and puts the uterus into the vaginal wall. If a man is an experienced operator, I do not think he need have any trouble in doing the Watkins-Wertheim operation. Wertheim claims it as his operation across the water, while we in this country give credit to Dr. Watkins. I am glad we have a right to claim it here. Some operators have accidents because in going in and pushing the bladder back they do not recognize the importance of getting the ureters out of the way and they get every now and then into the ureter. But I consider that one of the best operations we have.

It is necessary, of course, if one is going into this adequately, to go over the new anatomy of the uterine supports. We do

not find adequate discussion of this in books on anatomy of three or four years ago, but we do find it in journals on anatomy. The best fascial supports of the uterus give way, allowing herniation at the point of the uterine segment where the vessels come in; the vessels and the fascia go along together and one must recognize them. Prolapse is a real hernia. If one can get in there and repair the fascial supports, that go with the vessels, he would have an ideal supportive operation, but that cannot be done safely. Nobody has been able to do it yet. Certainly, it requires a great deal of skill. This is not a complicated operation as intimated by Dr. Bonifield, but a simple one. Why is it that we have more than a hundred operations recommended and advocated with one particular end in view? It is because of the continued failures of all the operations.

Dr. Bonifield.—We have failures because a great many men do these operations who do not know how.

Dr. Moore.—If there were not so many failures, nobody would propose other operations. If every man did the same operation and had the women come back to him and say they are well, then we will have accomplished what we started out to accomplish, and nobody will suggest another operation. We would accept it.

CYSTIC HYGROMATA AND OTHER TUMORS OCCURRING IN INFANCY

By Randolph Winslow, M.D.
Baltimore, Maryland

I desire to place on record the following cases of tumors of the neck and pectoral region in children which, though not unique, are rare and, I hope, of sufficient interest to justify their presentation for your consideration.

Case I (*Cystic Hygroma of the Neck*).—March 22, 1901, there was admitted to University Hospital, Baltimore, Willie B., aged fifteen months, with a large, soft swelling on the right side of the neck, extending from the mid-line in front almost to the mid-line posteriorly and from the ramus of the jaw to the clavicle. This was painless, not tender, freely movable laterally, but with little motion in an up-and-down direction. The skin was freely movable over the tumor and was of normal appearance. A sensation of semi-fluctuation seemed to be present. The mass seemed to be external to the sterno-cleidomastoid muscle. There was no glandular enlargement. The child was an exceptionally healthy looking and well-developed infant, and was apparently normal in every manner except for the swelling. He was born after a normal labor. My records do not state when the tumor was first noticed.

I had never seen such a condition in an infant and was uncertain as to the diagnosis. In the case of a man, some years previously, who had a large, soft tumor extending

from the base of the skull to the clavicle, I thought I had to deal with a branchial condition, but on operation a soft lipoma was easily hulled out. I was therefore inclined to think that the present swelling was a soft lipoma, and advised its removal.

Operation, March 23, showed that I had to deal with a multilocular cyst, containing a limpid fluid, with most extensive ramifications; the cysts becoming very minute and extending under the trachea and esophagus, and between the muscles in every direction. Unfortunately, the operation was prolonged and the child became shocked, from which he did not recover.

The report of the pathologist was simply "cystic hygroma."

During the same year another child with a somewhat similar appearing tumor was brought to me.

Case II (*Soft Lipoma of Neck*).—S. G., aged two years, had a large soft swelling in the mid-line of the root of the neck and overlying the sternum. It was soft, semifluctuant, painless, slow growing, and, as far as signs went, might have been a cystic hygroma, a thyroid, or possibly a thymus cyst. Bearing in mind the unfortunate termination of the preceding case I advised delay and sent the child home. I did not see him for fourteen years, when he returned to me in September, 1915, to have the tumor removed. He was now a strapping fellow, aged sixteen years, but the lump was of about the same proportionate size as it had been when he was first brought to me in 1901. It may, perhaps, have extended more over the sternum than it did at first. The diagnosis of lipoma was made, and the mass was enucleated without any difficulty.

In this case the diagnostic uncertainties were reversed, and instead of a hygroma there was a lipoma.

Case III (*Cystic Hygroma of Right Pectoral Region and Shoulder*).—E. W., aged four and one-half years,

Fig. 1.—Cystic hygroma of neck in child aged fifteen months.

Fig. 2.—Cystic hygroma of shoulder.

entered University Hospital November 4, 1908, and was discharged November 25, 1908. He is a healthy, plump, and well-developed boy, with a good appetite, regular bowels, and undisturbed sleep.

About two years ago he was run into by another boy, after which a lump formed on the right shoulder. The growth is situated on and anterior to the right shoulder, and has been growing insidiously for two years. It is about the size of a newborn baby's head, and is tense and cystic. On the interior of the lump, numerous small bodies like phleboliths can be felt, and numerous veins can be seen coursing over its surface. It is painless, movable, and uninflamed. There is no glandular enlargement. I am frank to confess that I did not recognize the condition, but thought I was dealing with a cavernous angioma, and undertook its removal with much trepidation.

Operation, November 16, 1908. A curved incision was made over the tumor with its convexity downward, and then it was seen that it consisted of myriads of vesicles filled with clear fluid. I was fortunate enough to be able to remove the mass without difficulty, and the patient made a good recovery.

In addition to the above cases I had the opportunity of seeing the following case, occurring in the service of my colleague, Dr. J. Holmes Smith, at the University Hospital.

Case IV (*Cystic Hygroma of the Neck*).—C. O., colored, aged nineteen years, was admitted March 18, 1912, and discharged "cured" March 28, 1912.

The patient is a healthy young colored man, and works in a glass factory. He came to the hospital on account of a large, soft swelling on the left side of the neck, which is about the size of a closed fist. His family and personal history are unimportant. About one year ago he first noticed a small swelling on the neck toward the back, which gradu-

ally increased and extended forward. There was no pain or tenderness nor glandular involvement, but about this time there seemed to be evidence of pressure, which distressed him.

Operation, March 21, 1912, by Prof. Smith. An incision disclosed a large, multilocular cystic tumor, containing clear, serous fluid. This mass was extirpated without much difficulty, and the patient made a good recovery.

The pathologist's diagnosis was "hygroma," the microscopic examination showing the cyst wall lined with an endothelial layer.

Notwithstanding the occurrence of these cases in my own practice, my interest in the subject was not specially aroused until I read the article by Charles N. Dowd in the *Annals of Surgery,* July, 1913.

The condition is rare and, according to Dowd, only ninety-one cases of cystic hygroma of the neck had been reported in the literature previous to his article—35 cases of cystic hygroma of the axilla and 11 cases in other portions of the body. Dowd reports four cases in his own practice occurring during one year. Since his article appeared other cases have been reported by Matthews, Downes, and Lyle in the *Annals of Surgery,* vols. lix and lx.

The disease occurs in infancy in the vast majority of cases, but may also occasionally be found in adults.

The diagnosis seems to me to be somewhat difficult, though with renewed attention called to the subject, hygroma should at least come into consideration in doubtful tumors of the neck and pectoral region occurring in infancy.

The symptoms in the cases observed by me were the occurrence of a painless, slow-growing tumor, soft and semi-fluctuating in consistence, with here and there harder lumps embedded in the mass. The skin was freely movable

over the tumor, but the growth was not freely movable on the underlying tissues. The large size of the tumors and the early age at which they occur are strongly suggestive of this condition. Males and females are affected in about equal proportion, with a slight preponderance of males. Right and left sides may be affected, but apparently it occurs more frequently on the right than on the left side of the neck.

I had supposed that these large cystic tumors were the result of an obstruction of the main lymph channels, but in such a case there ought to be an extensive lymph edema of the area drained by these lymphatics, which is not the case.

Dr. Dowd believes the condition is due to "embryonic sequestration of lymphatic tissue," and says the cysts have the endothelial lining of the lymph vessels, which can and should be demonstrated by staining them with nitrate of silver.

Treatment. The treatment of cystic hygroma is a matter for very serious consideration. According to the statistical tables of Dowd, 90 cases of hygroma of the neck were subjected to operative procedures of some kind, including punctures, injections, and excisions; with 39 deaths, or 43 per cent. mortality, while of 35 cases of hygroma of the axilla 5 died, or 14 per cent. Moreover, in many cases it will be impossible to remove the growth completely, and incomplete removals are followed by recurrence and, according to John B. Murphy, are liable to become carcinomatous. Punctures and injections seem to be attended with about as great mortality as excision, and are less certain in their results.

It would seem to be good policy not to operate on these cases in children unless pressure or other symptoms urgently demand intervention. When operation is indicated excision should be done.

Affections of the Submaxillary Salivary Gland. I have been much impressed with the infrequency of pathological conditions of the submaxillary and sublingual salivary glands. In a professional experience of more than forty years I have met with only a few ailments of the submaxillary gland, and, as far as I can recall, none of the sublingual, except possibly some cases of ranula. When we consider the location of these structures, with their ducts opening into the septic cavity of the mouth, and hence liable to infection, it is remarkable that inflammatory disorders are so seldom seen. Also, it is remarkable that glands that are so active functionally from infancy to old age should be so little liable to neoplasms.

The most frequent affection of the parotid gland is mumps, which, however, but seldom affects the other salivary glands; indeed, I do not know that it involves the sublingual gland at all, but I do know that the submaxillary may be involved, as one of my own children was taken with a painful swelling under the jaw which corresponded with this gland in shape and situation, and a few days later he was seized with a bilateral parotitis. Both of these conditions subsided in the usual time, and he made an uncomplicated recovery.

Salivary Calculus. Concretions may form in the ducts of any of the salivary glands, but they occur most frequently in Wharton's duct, the outlet of the submaxillary gland. It may form a hard mass in the floor of the mouth, which may be mistaken for a malignant growth. We should therefore bear in mind this fact before we do an extensive operation for the removal of a supposed carcinoma of the floor of the mouth.

Ranula. This is a cystic dilatation of the ducts of several glands situated under the tip of the tongue. It is frequently due to an obstruction of one of the ducts of the

sublingual gland, in which case it forms a cystic tumor projecting upward into the buccal cavity. If the ranula forms in Wharton's duct there will probably be a cystic mass projecting downward below the lower jaw. The treatment will depend upon the gland involved, and will be either excision of a large portion of the sac, with packing of the resulting cavity, or ablation of the respective gland.

Abscess. In consequence of infection traveling from the mouth down the ducts, inflammation and abscess occasionally occur in these glands. I have met with a remarkable case of this character which I desire to place on record.

Case I.—C. W., male, aged sixty years, a farmer by occupation, consulted me about a hard lump under the jaw, in the left submaxillary triangle. This had been noticed for several weeks, and was increasing in size. His family and past history were unimportant, and he had enjoyed good health all his life. He denied any venereal disease. He declined to have the growth removed. About a week later he returned, with a great increase in the size of the lump, which was now as large as a hen's egg, firm to the touch, and but slightly movable. On admission his temperature was 100°, and there was more or less pain and discomfort.

A diagnosis of malignant neoplasm of the submaxillary salivary gland was made, and immediate removal recommended.

December 1, 1900, the mass was excised without difficulty. It was hard, and when cut open proved to be the submaxillary gland forming a thick-walled sac containing nearly an ounce of creamy pus, in which was found the barb or head of some kind of grass or grain. It is probable that he had had a stalk of grass or hay in his mouth, the barb of which become detached and entered Wharton's duct, and finally passed into the gland itself. He was discharged "cured" in two weeks.

Neoplasms. The submaxillary and sublingual glands are subject to the same neoplasms as the parotid, but with nothing like so great frequency. The tumors occurring in these regions are usually mixed in structure, owing to their relation to the branchial clefts. In my own experience I have met with only one case of tumor of the submaxillary gland and none of the sublingual.

Case II.—M. G., white, female, aged twenty-four years, married, with two children, was admitted to hospital March 17, 1914. She first noticed a lump in the left submaxillary region when she was six years of age. It remained stationary until she was sixteen years old, when it reached its present size, and has not increased much since. The patient's health is unimpaired, and she came to the hospital to have the growth removed. The tumor is about the size of an ordinary hen's egg, and is irregular in shape. It is very hard and firm, painless, and without increased heat of surface. It is freely movable and unattached to the skin, but seems to be attached to the deep tissues. There are no lymphatic glandular enlargements.

A clinical diagnosis of tumor of the submaxillary salivary gland was made.

Operation. March 20, 1914. The mass was removed without difficulty and the patient was discharged four days later.

Anatomical diagnosis was "fibrochondromyxoma of the submaxillary salivary gland."

Tumors of the salivary glands are said to occur in the proportion of 10 of the parotid to 1 of the submaxillary, while the sublingual gland is affected in only 1 per cent. of all cases. The tumors, of course, may be either benign or malignant, and their chief peculiarity is due to the fact that they are usually composed of several diverse tissues.

DISCUSSION

Dr. James E. Thompson, Galveston, Texas.—I have listened to Dr. Winslow's paper with a great deal of interest and wish to make some remarks on cystic tumors of the neck. As regards cystic hygroma, this condition is found almost invariably in the lower portion of the neck, behind and posterior to the lower part of the sternomastoid muscle. These cysts have intimate connections with the terminations of the internal jugular and subclavian veins. There are often prolongations of the cyst into the axilla and even into the mediastinum. As regards their origin, there seems to be little doubt, from the writings of Dowd and Huntington, that they are developed from embryonic lymphatic sinuses which are seen in this situation.

As regards cystic swellings in the upper portion of the neck, I have made some interesting observations. The class of cystic tumors usually called "ranulæ" are not always derived from the same structures. Most of the simple ranulæ which are found in the mouth are situated underneath the mucous membrane and above the mylohyoid muscle. They are derived from mucous cysts. Compound ranulæ consist of two parts, which communicate with one another. One portion lies under the mucous membrane of the mouth above the mylohyoid muscle; the other lies in the submaxillary region below this muscle. Every ranula which may be termed compound lies usually near the mouth above the mylohyoid muscle or usually in the submaxillary region below the mylohyoid. Most of these do not rise from mucous cysts but are true dermoids. This, I have verified several times. One of my patients showed a distinct connection between a branchiogenetic dermoid derived from the second branchial cleft and one of these compound ranulæ. The patient showed a cystic swelling projecting into the right side of the mouth under the tongue, and another in the right submaxillary region. This was dissected out by an incision below the jaw. The cyst consisted of two sacs connected by a comparatively narrow neck, which wound around the posterior border of the mylohyoid muscle. The posterior boundary of the submaxillary cyst rested against the fascia which separates the submaxillary region from the deep cervical region. When the cyst was removed, it looked as if nothing else was left behind. I was about to close the wound up, when a drop or two of mucus

was seen to exude from the depths of the wound above. A probe was passed into this part of the wound and it passed into a large cavity. The opening into this cavity was then dilated and a fair quantity of mucus evacuated. On palpation of the interior, the finger passed to the base of the skull above. The under surface of the petrous portion of the temporal bone could be felt distinctly. The styloid process could be felt behind. The inner surface of the ramus of the jaw and the spine of Spix could be felt externally. Posteriorly, the carotid artery pulsated under the finger. The cavity was very large. No attempt was made to dissect out the lining membrane.

This is by no means the only case of this nature that I have met. I have seen the same condition of a large branchiogenetic cyst associated in one instance with three small cysts in the submaxillary region extending in a row along the lower margin of the jaw. In another instance, with one large cyst in the middle of the submaxillary region.

Dr. William A. Downes, New York City.—I think it is very appropriate that Dr. Winslow has called our attention to hygroma of the neck. I was associated with Dr. Dowd at the time he brought out his paper, and I can speak in reference to the difficulty in the diagnosis and difficulties of the operation. As Dr. Blair has suggested, if a less radical procedure is done in the younger children the results would be better.

As to the type of case Dr. Blair spoke of, I too am sending my cases to the radium specialist, not with a great deal of success, but certainly radium promises more than surgery in this type of case.

Dr. Winslow (closing).—I wish to thank Dr. Thompson for mapping out a piece of investigation he has assigned to me, but as I retired from the anatomical room twenty-five years ago, I am afraid I will not be able to take it up.

SUBSTITUTION OF THE ANAL FOR THE VESICAL SPHINCTER IN CERTAIN CASES OF INOPERABLE VESICO-VAGINAL FISTULÆ

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No doubt, due to better obstetrics, vesicovaginal fistulæ are much less common today than formerly. Large defects in the vesicovaginal septum are rarely met with, and no matter what may be the cause, can usually be repaired by modern aseptic plastic methods, not always at one operation but finally after a varying number of attempts. No case of vesicovaginal fistula, no matter how extensive, should be considered hopeless from an operative standpoint, provided the vesical sphincter and the adjacent portion of the urethra be intact. The same, however, cannot be said of those cases in which, from excessive trauma and subsequent sloughing, the vesical sphincter has been destroyed. No plastic surgery can make a sphincter muscle; it can repair but not create one.

In addition to those cases in which the vesical sphincter has been completely destroyed are cases in which it has been removed with more or less of the adjacent bladder and urethral tissue for malignant disease of these parts. There are still other cases in which, from extensive trauma due to childbirth or other causes, the bladder, with a defective vesicovaginal septum, is immovably fixed in the

pelvis by adhesions from the introitus to the upper bladder wall. Attempts at repair of such cases are almost hopeless from the start, although attempts at repair should be made, as the vesical sphincter still persists.

When repair of the fistula and control of the urine are hopeless, or where the fistula still persists in spite of all attempts at repair, the woman must be abandoned to her fate and left to pass an existence made miserable and pitiable by the constant dribbling of the urine, or the rectal sphincter must be utilized for the control of the urine. The urinary stream can be directed into the bowel in a number of ways: The severed ureters may be implanted in the sigmoid or upper rectum either by the extra- or intraperitoneal route; the ureters with a portion of the trigonum may be implanted into the bowel or finally an opening may be made in the vesicovaginal septum and the introitus closed (colpocleisis), so as to divert the urinary stream from the bladder into the vagina, thence into the rectum, where the latter will act as a reservoir for the urine by means of the rectal sphincter.

In 1899,[22] after an extensive series of experiments on dogs, with different methods of anastomosing the ureters with the bowel, I found that all efforts to prevent ascending renal infection in animals or in man where the ureter had been implanted in the intestine without its vesical orifice had proved futile. It is impossible to determine in advance before such operations the extent of the renal infection which will result from uretero-intestinal anastomosis, since the patient may die in a few days of a pyemia or in a short time of pyelonephritis, or in rare cases may recover from the infection with resulting contracted kidneys. Evidently it would be unjustifiable to employ such an operation for the relief of a condition which, intensely distressing from the patient's inability to control her urine, is not dangerous to life.

In animals and in man it has been proved by numerous experiments and operations that ascending renal infection does not, as a rule, follow implantation of the vesical flap with the ureteral orifices into the intestine. Ureterotrigino-intestinal anastomosis (Maydl's operation) therefore is a perfectly justifiable and practical procedure. The objection, however, to its use for inoperable vesicovaginal fistulæ is that it is an operation of considerable magnitude and not unattended by danger of primary death. This leaves, as a final recourse in a serious situation, an operation in which the ureteral orifices are left undisturbed, thus reducing the dangers of ascending renal infection to a minimum and the diverting of the urinary stream into the rectum to be followed by a closure of the vaginal orifice. In the paper reporting the ureteral experimental work already referred to I cited a number of cases, reported in the literature, in which such operations had been performed with good results so far as freedom from infection was concerned and the feasibility of controlling the incontinence by transforming the rectum and its sphincter into a urinary bladder. Particularly interesting was the case of Keen, in which a woman, aged thirty-four years, had been left with a vesico-vagino-rectal fistula from severe sloughing after typhoid fever. After a number of unsuccessful plastic operations for the closure of the fistulæ the entire vulvar aperture was closed. Following this operation the patient defecated, urinated, and micturated entirely by the rectum, and was in perfect health twenty-two years after the operation, with no signs of renal infection.

In 1904 (Case 40 [24]) I removed nearly the entire urethra for a malignant growth in a woman aged sixty years. Following the operation there was complete incontinence of urine, with a prolapse of the bladder wall through the relaxed and dilated urethral opening. At a subsequent

operation the prolapse of the bladder was cured by the closure of the urethral opening and the formation of a vesicovaginal fistula. Subsequently, to relieve the great sufferings of the patient, caused by the constant dribbling of the urine, a rectovaginal opening was made and the vaginal aperture completely closed. The patient made a good recovery and left the hospital in good condition, passing the urine by the rectum about every three hours during the day and only once or twice at night. Subsequently, with the exception that both vesical and rectal openings had to be enlarged on account of contraction, the patient led a very comfortable existence until her death, seven or eight years later, from malignant disease of the cecum.

In February, 1916 (Case 41 [23]), I performed, at the University Hospital, the same operation upon a woman, aged thirty-eight years, whose soft parts had been frightfully mutilated by an instrumental delivery at her sixth pregnancy. Upon entrance to the hospital she had lost fifty pounds, and was in a deplorable condition through the irritation caused by the urinary incontinence. An examination under ether showed the upper portion of the vagina completely shut off by adhesions, with no traces of the cervix to be seen or felt. There was absolutely no give to either the anterior or posterior vaginal wall, the tissues resembling those met with in extensive pelvic inflammatory cases. An attempt to loosen the bladder wall about the vesical opening, which was larger than the end of the thumb, completely failed. At a subsequent operation an opening, one inch and a half by one inch, was made in the rectovaginal septum just above the internal sphincter, the rectal and vaginal mucous membrane layers being united by interrupted chromic catgut sutures. The tissues about the introitus were freshened and united by buried chromic catgut sutures, with silkworm-gut sutures for the skin, thus effectively closing the vaginal aperture.

Healing was by first intention except for a small opening in the colpocleisis wound, which closed before the patient left the hospital.

The woman had been informed that she probably would either have to have the ovaries subjected to the *x*-ray or have them removed in order to prevent menstruation, since no cervix or cervical opening had been discovered at the operation. However, just before leaving the hospital she reported that she was passing blood with the urine by way of the rectum. The passage of a catheter through the anus demonstrated the presence of urine, feces, and dark menstrual blood. Naturally, she was discharged to await developments.

In a letter from the patient received December 6, 1916, ten months after the operation, she states she is in good health and very comfortable except for pain just before the flow starts. After the flow begins the pain stops instantly. She passes her urine by the rectum about every four hours during the day and once during the night. She is not constipated but has a number of liquid stools a day.

Evidently in this case there is a cicatricial contraction about the external os so closing the opening as to require some uterine contractions before the menstrual blood is forced through. It is extremely doubtful whether the cervical opening can be found and dilated through the vaginorectal opening, since it could not be found at the operation when the shut-off upper vagina was in plain view. In case the patient has further trouble it would seem best to secure permanent amenorrhea by one of the methods referred to above, although, as will be brought out later, a study of similar cases shows that permanent amenorrhea is not uncommon after these operations.

As an aid to the consideration of the different interesting problems the procedure we are studying offers, I have made a careful search of the literature for similar opera-

tions. I was somewhat surprised to find that 41 such cases have been recorded, including 2 personal cases and 1 case operated by my former assistant, Dr. H. H. Cummings. Inasmuch as the task of collecting these cases has been somewhat laborious it has been thought best in order to save some future investigator a similar labor to give a short abstract of each case. Chronologically these cases are as follows:

Case 1 [21] (Maisonneuve).—Patient had a large vesicovaginal fistula, with posterior wall of urethra gone. In 1851 vagina was closed, with the exception of an opening in which a catheter was inserted. Four days later union was complete except where catheter had been. Into this opening an obturator was inserted. However, patient could not bear this. Then urethra was closed and a vaginorectal fistula was made which could not be kept open. Author intended to make a perineal fistula, but patient died from septic phlebitis before this operation was performed. Autopsy showed complete union of vagina, a vesicovaginal fistula 6 cm. in circumference, a small fistulous opening between rectum and vagina, normal vaginal and rectal mucosæ.

Case 2 [5] (Brown, I. B.).—Primipara, aged forty-two years, instrumental delivery after thirty-six hours' labor. Operated for fistula sixteen years later (1861). Vagina nearly occluded, fistula admitting finger into bladder, urethra gone, also a rectovaginal fistula. Vulva was closed and patient passed urine per rectum. Cured after four operations.

Case 3 [26] (Rose, E.).—Entire upper portion of vaginal wall had been destroyed by diphtheritic ulcers, also almost entire lower wall of urethra. An opening was made into the rectovaginal septum 2 cm. above the anus and about 2 cm. wide. The mucous membranes of rectum and vagina united by three sutures and the inner surfaces of labia

were freshened and united by suture. Nine months elapsed before the vagina was permanently closed. Operated on in December, 1872. Menstruated through rectum. January 22, 1873, patient was able to hold urine two or three hours. Not until August were three fistulæ in wound closed. Patient died in September, ten months after operation, from uremia due to nephritis. Death was not due to operation. Autopsy showed vagina and rectum normal.

Case 4 [25] (Rose, E.).—Patient, aged thirty-nine years, with a large vesicovaginal fistula, had several unsuccessful operations up to 1883, when she was examined by author. Very little of urethra left. During winter of 1883-4 vulva was closed and a rectovaginal fistula made. Vulva completely closed after five operations. Patient in good health nineteen years after operation. Is a hard-working woman, and has never had any pain or untoward symptom from the operation. Urinates twice during night, and is constipated.

Case 5 [25] (Rose, E.).—Patient operated on in 1879 for carcinoma. Recurrence in 1886. The entire scar was removed, also the clitoris, urethra, and finally the entire vesicovaginal septum up to the uterus. Eight weeks later, August 17, the vagina was closed and a rectovaginal fistula formed. Small fistula remained. September 7 patient could retain urine for one hour. However, she died very suddenly from uremia due to metastases on the ureters. Both ureters were dilated.

Case 6 [15] (Keen, W. W.).—Patient, aged thirty-four years, with a vesico-vagino-rectal fistula from severe sloughing after typhoid. Several unsuccessful attempts made to close fistula. Finally vulva was closed. Menstruates and passes urine by way of rectum. Urinates five or six times during day and once or twice during night. No feces in vagina or bladder. Eleven years after operation a calculus was removed from the vagina; recovery in three or four

days. Subsequent history entirely satisfactory. In perfect health, with no signs of renal infection twenty-two years after operation. Small fistula formed, which closed spontaneously.

Case 7 [8] (Cazin).—Primipara, aged twenty-three years, had a vesicovaginal fistula after instrumental delivery in 1870. There was no trace of urethral orifice, and the entire superior wall and the cervix were involved, being almost entirely destroyed. Operation in 1876. Several operations were necessary before vagina was permanently closed. Urinates every three hours per rectum. A mucous fold closed the fistula, preventing feces and gas from passing into the vagina.

Case 8 [11] (Goodell, W.).—Primipara, aged twenty-five years, impacted shoulder several hours before physician came. Sloughing of womb, base of bladder, and entire track of vagina and all of urethra. Vagina nearly closed by cicatricial contraction, urine dribbling constantly. Twelve years after confinement vagina was closed and a rectovaginal fistula formed. At first passed urine every few minutes, later could hold it for six hours. Gets up twice at night. Thirteen years after operation a fistula developed near the arch of pubic bone from which urine dribbles. Much albumin in urine. No menstruation after delivery. Vagina permanently closed after two operations.

Case 9 [10] (Goodell, W.).—An unmarried girl in whom the cervix could not be found and the whole base of bladder was gone, also had a large rectovaginal fistula caused by sloughing. All pelvic organs matted together from neglected labor. Vulva was closed.

Case 10 (Morisani, quoted by Spinelli).—Patient, aged thirty-three years, entered clinic April, 1876. Difficult labor lasting six days; forceps delivery. Urethra completely destroyed, also vesicovaginal septum, prolapse of bladder, vagino-vesico-rectal cloaca. May 28, 1878, vulvo-

vaginal occlusion. Two small openings remained. Repeated cauterization with silver nitrate. Recovery complete. Patient left clinic June 29, 1878, completely cured. Passes urine with the feces voluntarily by way of rectum. Two years after operation in perfect health. Does not menstruate.

Case 11 [30] (Morisani).—Patient, aged thirty-two years, entered clinic December 15, 1880. Protracted labor, seven days, spontaneous expulsion of dead fetus. Cicatricial tissue in anterior quarter of vagina with a central opening admitting the index finger. Destruction of the urethra and the entire vesicovaginal septum. Amenorrhea since birth of child. Urogenital cloaca, with complete destruction of urethra. Perforation of rectum about 4 cm. above the anus, vulvovaginal occlusion May 20. Result not satisfactory, two operations necessary, repeated cauterization with silver nitrate. Patient left clinic June 22, 1881. Passed feces and urine voluntarily by rectum for over a year. Returned in January, 1883. Two fistulous openings found along occluded vulva from which trickled urine. A large number of calculi in cloaca, some of good size. The rectovaginal opening had closed. Vulva incised and calculi removed, one size of pigeon's egg. Opening in rectum again made and vulva closed. From then to 1893 she urinated by rectum. Has not menstruated.

Case 12 [30] (Morisani).—Patient, aged thirty-four years, was delivered by forceps in June, 1883, after two days' labor. Feces and urine passed by way of vulva. Complete destruction of urethra and vesicovaginal septum. Perforation of rectum about 2 cm. from anal sphincter, recto-vagino-vesical cloaca. July 9, 1884, occlusion of vulva with incomplete result; second operation October 7, five metallic sutures; third operation January 5, 1885, silk suture. Small opening remained, which was closed by cauterization. Left clinic July 6, 1884, completely recov-

ered. Passed urine and feces voluntarily by way of rectum. Two years after in good health, amenorrhea. Urinates every two hours.

Case 13[30] (Morisani).—Multipara, aged twenty-five years, delivered by forceps after a long labor, pathological puerperium, large urogenital cloaca, urethro-vesico-vaginal septum completely destroyed. January 8, 1886, recto-vaginal perforation with cautery. January 26, vulvo-vaginal occlusion with silk suture. Fistula remained in inferior angle of wound which was closed by cauterization. Left clinic July 6, 1886, fully recovered. Passes urine by way of rectum every two hours. One year after operation condition satisfactory. Retains urine three hours. No disturbance in intestinal function, amenorrhea.

Case 14[30] (Morisani).—Primipara, aged eighteen years, was delivered in January, 1886, after long labor and various operative attempts to extract the fetus. The urethro-vesico-vaginal septum was completely destroyed and there existed a large urogenital cloaca. March 13, 1886, recto-vaginal perforation with the cautery. April 5, vulvo-vaginal occlusion, silk suture. Result not altogether satisfactory. On the eighteenth day after operation patient was taken with pulmonitis to which she succumbed.

Case 15[30] (Morisani).—Patient, aged twenty-three years, delivered herself spontaneously of a dead fetus after three days' labor in December, 1886, pathologic puerperium, complete atresia of vagina. In the cicatricial tissue is a small opening admitting a small probe from which urine trickles continually. There is no trace of the urethra, a urogenital cloaca. Multiple incisions were made in the tissue and the vagina dilated slowly. May 25, 1887, perforation of the rectum and vagina with the thermocautery, vulvovaginal occlusion with silk suture. Three operations necessary and then a small fistula persisted, which was closed by cauterization. Left hospital in July, 1888, com-

pletely recovered. Rectal micturition every hour; no irritation on part of rectal mucosa. Two bowel movements every day. Five months after operation patient held the urine three hours. No pain during menstruation; no kidney disturbance. Patient nervous. Nothing heard from patient since then.

Case 16 [30] (Morisani).—Girl, aged eight years; gunshot wound; had a urogenital cloaca and complete destruction of the urethro-vesico-vaginal septum. This occurred December 18, 1886. March 20, 1887, an opening was made into the rectum with the thermocautery; May 2, vulvovaginal occlusion. Operation not entirely satisfactory; two operations with only partial success. July 13, 1887, there was still an opening in the vulvar cicatrix from which urine flowed. Nothing more heard from the patient.

Case 17 [30] (Morisani).—Multipara, aged thirty years, fifth pregnancy; November, 1887, three labors at term, long spontaneous deliveries. Fetuses died during delivery, one abortion at seventh month, last a forceps delivery. Immediately afterward loss of urine from vagina. Pathological puerperium. Large urogenital cloaca with complete destruction of urethra. Vesical mucosa outside of vulva, laceration of perineum to the anal sphincter. December 9, 1887, perforation of rectovaginal septum with the thermocautery. January 3, 1888, perineorrhaphy and closure of vagina. Good result. Left clinic March 15, completely recovered. During stay in hospital she urinated per rectum every two hours, one bowel movement a day. Function of anal sphincter perfect. Three years after operation condition of patient satisfactory; amenorrhea.

Case 18 [30] (Morisani).—Primipara, aged twenty-three years, was delivered by forceps of a dead fetus February, 1888. Four days after delivery urine trickled from vagina. Complete destruction of the urethro-vesico-vaginal septum, complete laceration of perineum and rectum to 5 cm. from

anal sphincter. Vesical mucosa outside of vulva, prolapse of rectal mucosa, uro-genito-rectal cloaca. March 2, 1888, entero-perineorrhaphy. In rectal wound was a fissure about 3 cm. long. April 4, occlusion of vulva, partial success. May 3, a second operation. A small opening persisted which was closed by cauterization with nitric acid. Patient left clinic July 22, 1888, completely recovered. Urine expelled from rectum every three hours; one bowel movement a day; amenorrhea. In the course of six years patient has been seen several times. The rectovaginal communication persists, an opening about 1.5 cm. long and 2 cm. from anal sphincter. Urinates every four hours; no disturbance in function of intestine. Anal sphincter weakened; retention of urine not perfect, a small amount of urine escaping along the anal fold. Suffers from amenorrhea.

Case 19[30] (Morisani).—Primipara, aged twenty-seven years, was delivered of a dead fetus by forceps in December, 1889. Labor had lasted six days; pathological puerperium. Immediately after delivery there was incontinence of urine; six days after fecal matter escaped from vagina. Prolapse of anterior wall of bladder and about 4 cm. of urethra. In the rectovaginal septum, is an opening about 3 cm. in diameter, the inferior margin of which is a little more than 2 cm. from the anal sphincter, uro-genito-rectal cloaca. January 15, 1890, closure of the vulva, partial success. Several operations after this. June, 1890, there was still an opening in the line of occlusion. March 10, 1893, suture of this opening, another operation before vulva was completely closed. April 5, 1893, patient was discharged from clinic in perfect health. Passes urine and feces voluntarily by way of rectum; amenorrhea. Nothing heard since then.

Case 20[30] (Morisani).—Secondipara, aged thirty years, first labor normal followed by febrile puerperium. Second

labor hard, distocia, extraction of fetus difficult and complicated. Immediately afterward incontinence of urine, fecal matter passing from vagina, pathological puerperium. Laceration of perineum second degree, prolapsed anterior and posterior walls of vagina. In anterior wall is a large opening resulting from destruction of almost the entire urethra and the vesicovaginal septum. Much cicatricial tissue in cloaca. Not more than 2 cm. of urethra left, prolapse of vesical mucosa. On posterior vaginal wall is a small opening establishing communication between vagina and rectum, urogenital cloaca. June 12, 1892, suture of rectovaginal fistula with catgut, formation of a new rectovaginal fistula about 3 cm. from anal sphincter. Vaginal and rectal mucosa united with catgut. Complete recovery from previous rectovaginal fistula, artificial rectovaginal fistula sufficiently large. October 25, 1892, vulvovaginal occlusion, partial success. November 13 another operation with perfect success. December 8, 1892, discharged from clinic. Passes urine voluntarily by rectum, obstinate constipation; amenorrhea. April, 1894, general health good, passes urine by rectum. From time to time a small reddish area is formed in the vulvar cicatrix which ruptures, discharges urine and disappears.

Case 21 [2] (Antal).—Primipara, aged twenty-two years, had a vesicovaginal fistula from protracted labor. Greater portion of vagina destroyed. Upper margin of fistula and remaining portion of anterior vaginal wall drawn back to posterior vaginal wall; side walls and lower margin of fistula fixed to symphysis. Only 1.5 cm. of lower urethral wall left. Almost entire posterior vaginal wall consisted of scar tissue. Three unsuccessful attempts made to close fistula. A rectovaginal fistula was then made by removing from the rectovaginal septum a portion 1 cm. in length by ¾ cm. in width. Mucosa of rectum and vagina were united by suture. Vaginal orifice was then closed with

ten silver sutures. Rubber tube inserted into rectum passing through fistula and into bladder; left five days. After its removal patient urinated per rectum every one-quarter to one-half hour. A fistula persisted in vagina which was finally closed by two metallic sutures after several attempts to close it with the thermocautery. Several months after operation patient urinated per rectum every two to two and one-half hours with no pain nor any inconvenience whatever. Menstruates regularly by way of rectum with but little pain. No change in mucous membrane of the rectum. Rather constipated.

Case 22 [20] (Lomer).—Primipara, aged twenty-five years, forceps delivery seven years previous. Soon afterwards involuntary micturition. Several unsuccessful attempts made to close fistula; also obliteration of vagina. At entrance to hospital April 27, 1880, examination showed the following: vaginal orifice closed with exception of a fistula 1¼ cm. across and ¾ cm. long. Urethra 1½ cm. long to anterior margin of fistula. About the center of urethra is a small opening, vesicovaginal septum absent. From the os two scars pass over into posterior vaginal vault, uterus movable; conditions unfavorable. Attempt made to close fistula, patient dry for two days. Wound not healed when sutures were removed. May 27, formation of a rectovaginal fistula. July 28, rectovaginal fistula admits tip of finger. Gas and feces pass through vagina. Closure of defect in vagina and also urethra. August 12 a fistula in lower angle of wound through which pass gas and feces. January 28, 1881, the following is found: from the os extends bridge like scar tissue to the posterior vaginal vault and anteriorly to the rectal fistula. This does not allow the blood and urine to flow through the fistula but allows the feces to pass into the vagina. Scar tissue cut but no better results obtained. Patient in worse condition than before. Rectovaginal fistula was closed again and vagina opened.

Case 23 [4] (Schroeder).—Primipara, aged thirty-two years, entered clinic April 18, 1881. Was delivered by forceps in March, 1881, after protracted labor. Six days after delivery urine and feces escaped by way of vagina. Bladder prolapsed; entire urethra and the greater part of vesicovaginal septum gone. Posterior vaginal wall preserved. About 4 cm. above anal sphincter is an opening easily admitting finger. Vesicovaginal fistula admits two fingers. Edges of vulva freshened, clitoris excised and vagina closed. Two fistulæ persisted in vagina, one the size of a sound and the other the size of a lead-pencil. Through these urine escaped constantly. Rectal fistula became smaller. Seven operations were necessary before vulva was permanently closed and then a small fistula persisted through which some urine escaped. Rectovaginal fistula still had to be dilated every other day eleven months after operation. Patient urinated every two to three hours with great pain, was very constipated, menstruated per rectum. Symptoms became more and more severe and finally intolerable. Gas and feces passed into cloaca. In October, 1882, vagina was opened again and patient was greaty relieved. All symptoms disappeared. Cloaca filled with gas, feces and urinary concrements.

Case 24 [7] (v. Dittel).—Secondipara, aged twenty-nine years, was delivered by forceps 1875. Soon after urine trickled from vagina. Examination showed a large opening from vagina into bladder. Only anterior portion of urethra exists. Closure of vagina November 2, 1880. Six days after operation union seemed complete. However, by December 26, there was an opening 2 cm. long and 1 cm. wide. Attempts made to close it, but without success. By January, 1881, patient in worse condition than before operation. An opening was made about 1 cm. above external sphincter; drainage tube inserted. Patient anemic from loss of blood during and after attempts to close

vagina. October 1, 1881, rectovaginal fistula made larger by thermocautery. After seven operations, one year after first attempt vagina was permanently closed. Holds urine 3 hours.

Case 25 [14] (Kaltenbach).—Operation performed as a last resort. Patient, aged twenty-five years, had had four operations for vesicovaginal fistula. Cicatricial contraction of vagina. Two unsuccessful attempts to close fistula. Then a rectovaginal fistula was formed. Four operations for closure of vagina. Results satisfactory. Urinates per rectum every three or four hours. Menstrual flow by way of rectum without pain. No fecal matter nor gas in vagina. Desire to pass urine comes on very suddenly, showing that the bladder empties the urine into the rectum only after it is full. Three months after operation rectovaginal fistula still has tendency to contract, but is large enough for index finger to pass. There was a mucous fold which closed the fistula and kept gas and feces from passing into the vagina.

Cases 26 and 27 [8] (Fritsch).—Mentions two successful cases. One patient operated on years ago urinates per rectum, no symptoms whatever. Second patient operated upon four years ago, works hard. Has no symptoms and urinates per rectum.

Case 28 [18] (Küster).—Patient, aged fifty-five years, had the entire urethra and also the vesical sphincter removed for carcinoma of clitoris. One year after this operation a large rectovaginal fistula was made and the vagina closed. A small fistula persisted but caused so little inconvenience that no attempt was made to close it. A few months later, however, patient came back suffering intensely. This was due to stones in vagina. Six about the size of a pea were removed. At this time an attempt was made to close the small fistula. However, it became larger. Patient urinates per anum every two hours and feels well and happy.

Case 29 [1] (Andrejeff).—Patient, a peasant woman, aged twenty-eight years, was perfectly well in her youth. Married at sixteen and soon after became pregnant. In good health until end of pregnancy when she noticed swelling of legs up to knees. Several hours after beginning of labor had convulsions. In labor five days; spontaneous delivery of a large dead child. Immediately afterwards patient could not retain urine. From that time on almost for twelve years she suffered from incontinence of urine and from irritation caused by the constant flow of urine. This finally led patient to seek help at the hospital. Examination showed a generally contracted pelvis; tear of perineum of first degree; labia majora chafed and extremely painful. On the right labium minus was an opening ½ cm. in diameter, the left being torn to its base. There was no external opening of the urethra; complete destruction of latter. Immediately behind external opening into the vagina was a ring shaped cicatrix surrounding an opening which admitted about half of the forefinger. Mass of scar tissue from the neck of the bladder to the anterior wall of vagina and passing into the ring shaped cicatrix described above. All this was apparently the result of protracted labor with a large child passing through the contracted pelvis. January 19, 1890, artificial rectovaginal fistula was formed, about 2 cm. long, edges of vaginal and rectal mucosa united with catgut. Drainage tube 10 cm. long inserted and removed on ninth day. Menstruates with but little pain. February 2 vagina was closed. Three days after operation patient menstruated with great pain. At next menstrual period there was no pain. Controls urine during day; urinates every three or four hours. Three and one-half months after operation condition of patient was as follows: Able to retain urine three or four hours and even longer. Urine clear, no albumin. Menstruation every three weeks lasting three or four days without pain, no

clots. Fecal matter never passed into vagina. Patient feels so well that she considers herself entirely recovered and returned to her home.

Case 30[12] (Jakowlew).—Primipara, aged twenty-six years, was admitted to the hospital June 2, 1889, complaining that she could not retain her urine. One and one-half months previous to this she had given birth to her first child, labor lasting four days, child dead, unusually large. Mother in bed a long time. After this noticed urine continually dribbling from vagina. Nothing abnormal in pelvic cavity except fistula which admitted end of little finger and was surrounded by scar tissue. Through external opening of urethra no catheter or sound could be passed. Vaginal walls formed by scar tissue. Finger could be passed through opening in vaginal wall into bladder. Cervix could not be reached. Also an opening in rectovaginal septum. Impossible to perform any plastic operation. September 30, episiocleisis. Entire first week after operation large part of the urine was passed per rectum and the patient remained dry. October 7, the sutures were removed and the wound was healed throughout its entire extent. October 17, a small fistula was discovered in upper part of wound which allowed urine to escape. By November 7 the urine ceased to flow through the fistula in the upper part of the wound. Two months after the first operation urine flowed from the vagina into the rectum and was retained there. November 26, episiocleisis was completed, no untoward symptom after operation. Two months have passed and patient remains dry. The urine accumulates in rectum and is retained there two or three hours and sometimes even longer. November 29 to December 5 patient had diarrhea which was rather profuse. After cessation of this to time when patient left hospital, January 25, 1890, there were no pathological manifestations.

Case 31[17] (Koteljansky).—Patient, aged twenty-five years, married five years, gave birth to a full-term dead child. Parturition difficult, lasting forty-eight hours. Several hours after delivery noticed involuntary flow of urine. She entered the maternity clinic November 3, 1889, two months after delivery. Patient weak, exhausted, pale and thin; chest normal, blood normal. Labia normally developed. Catheter inserted into external opening of urethra entered to a depth of about 0.5 cm. This was the only part of the urethra which remained intact. In the vagina were bands of tissue and even after their removal the finger could be inserted only 3 cm. Cervix could not be reached. In anterior and posterior vaginal wall were openings communicating with the urethra, bladder and rectum. The urethrovaginal and vesicovaginal fistulæ were fused in consequence of which the middle portion of the front wall of the vagina was absent. The rectovaginal fistula was in the most remote part of the vagina. November 19, the urethro-vesico-vaginal fistula was closed with carbolized silk, six deep and four superficial. This was unsuccessful. November 28 a second operation was performed with negative result. When stitches were removed December 4, it was noticed that the rectovaginal fistula had closed. Four other attempts were made to close the urethro-vesico-vaginal fistula without success. Patient made a good recovery after each operation. It was now decided to close the vagina and make a rectovaginal fistula. Patient went home May, 1890, to improve her health and returned September 21, 1890. The entire vagina was covered with cicatricial tissue even less penetrable than before. Her general health had improved. The operation was done at two different times, first the formation of a rectovaginal fistula and second episiocleisis. October 6, 1890, the rectovaginal fistula was formed, 1½ cm. in width. A drainage tube was inserted and taken out the sixth day. Union of

vaginal and rectal mucosa was so firm that no trace of either could be found. Bowels moved twice a day and did not pass into the vagina. October 21 patient began to menstruate, flowed only twenty-four hours. October 26 episiocleisis was performed. On first day urine was passed through anus, patient dry. Micturition three or four times a day. October 29, signs of irritation of bladder, urine discolored, temperature 38° C. This was the only rise in temperature during her stay in hospital. Four operations were necessary before complete closure of vagina was effected. November 26, patient was dismissed from hospital in perfect health.

Case 32 [28] (Rossi).—Large vesicovaginal fistula, with destruction of urethra. Formation of a rectovaginal fistula and colpocleisis. Anal sphincter retains urine two or three hours.

Case 33 [19] (Lipinsky).—Patient, aged twenty-eight years, had had an abscess in right inguinal region leaving a fistula. This occurred two years before marriage. One year after marriage another abscess formed in region of right posterior iliac spine. Two years after marriage had typhoid fever. Fifteen months after this she was delivered of a dead child after three days' labor. Two days after delivery she began to urinate involuntarily and two weeks later, July 25, 1891, came to the clinic. Patient anemic. On anterior wall of vagina, at the level of margin of vaginal introitus is a fistula leading into a cavity in which the horizontal and descending branches of pubic bones are felt below. Uterus distinctly palpable by rectal touch; vagina much retracted. Vaginal mucosa consists of cicatricial tissue. Little left of urethra. Several attempts made to close fistula but were unsuccessful. Patient left hospital to improve her health. Entered again October 4, 1892. October 11, episiocleisis was performed, but on removing sutures there was still a small fistula in one corner.

November 15, a second operation was performed resulting in complete union. However, there was incontinence of urine and a rectovaginal fistula had to be made. Incision in anterior rectal wall 1½ cm. long at level of superior fibers of sphincter. A flap was dissected from each side of vulva and freshened surfaces united with metallic sutures. Nelaton catheter introduced into vagina through rectal fistula. Catheter obstructed first day and glass tube had to be inserted. Several operations before union was complete and then a small fistula remained. Patient weakened from repeated operations. Left hospital to recover health. Urine still flowed involuntarily. Little by little urine ceased to flow. August of following year she urinated three or four times in twenty-four hours, not during night. Has no pain, urine clear, reaction acid, stools normal.

Case 34 [19] (Lipinsky).—Primipara, aged thirty-one years, delivered one and one-half years before of a dead child, labor lasting two and one-half days. After delivery fever and involuntary micturition. January 13, 1896, entered hospital. External urethral orifice leads into a canal ½ cm. long. Superior edge of fistula is formed by a flap extending to posterior vaginal wall. Uterus can not be felt. On posterior vaginal wall is a semicircular cicatrix surrounding a rectovaginal fistula 1 cm. in length. Episiocleisis. Small fistula persisted in superior angle of wound. This was closed by a second operation.

Cases 35 and 36 [29] (Rydygier).—Entire urethra and neck of bladder removed for carcinoma. Two cases. In order to keep fecal matter from entering vagina and bladder a triangular flap was cut from the posterior vaginal wall thus forming a triangular rectovaginal fistula. This flap is then placed into the rectum, the fistula closed from the bottom up so that there remains only a funnel-shaped opening above. This flap acts as a valve and allows the urine to pass into the rectum but not the gas or feces into

the vagina. The opening must not be left too large or else the flap might swing through it into the vagina. Vagina was then closed.

First case was not successful because patient did not remain in hospital until vagina was completely closed. Second patient still had a small fistula in wound which was to be closed later.

Case 37 [16] (Kliatchkina).—In this case there was great loss of substance after delivery. A longitudinal opening was made into the rectovaginal wall and the vagina closed after five operations. Two months after operation patient urinated by rectum every three or four hours. Menstruation takes place per rectum.

Case 38 [9] (Gallet).—Mentions case in which a vesicovaginal fistula existed. Closed vagina and made opening into vaginorectal septum. Patient did well and was able to hold urine two hours.

Case 39 [23] (Cummings).—Patient, aged sixty-five years, had extensive sloughing of bladder following vaginal hysterectomy. Large mass of everted bladder mucosa in vagina and ureteral openings so near edge of opening as to preclude closure of fistula. Result after number of operations not entirely satisfactory, since it was impossible to completely close vagina, a small opening persisting near site of urethra through which a small amount of urine escaped. Patient quite satisfied when she compares her present condition with what she suffered prior to operation.

Dates of the Operations. According to Lipinsky the first utilization of the rectal sphincter for the control of the urine after the formation of a vesico-vagino-rectal fistula and closure of the vagina (colpocleisis) or the vulva (episiocleisis) is to be credited to Maisonneuve, who performed the operation but without success. The operation had been suggested but not practised by Jobert in 1836 and Bérard in 1845. (See Amabile bibliography, 3.) It is inter-

esting to study the occurrence of the operations by decades since naturally there would be more prior to the perfection of plastic pelvic surgery. In the following table the cases are arranged by decades in accordance with the dates of the operation or where those are omitted according to the time the cases are reported.

CASES BY DECADES

	1851 to 1861	1861 to 1871	1871 to 1881	1881 to 1891	1891 to 1901	1901 to 1911	1911 to 1916
Number of cases....	1	1	7	22	7	1	2

The large number of cases during the decade 1881 to 1891 may be explained by the great number of the operations in question [11] performed by Morisani and reported by Spinelli. It is a large number of operations to be performed by one man and can only be accounted for by poor obstetrics and that the unfortunate victims of such work were brought to Morisani's clinic and were in such a condition that plastic surgery was hopeless. I would like to think that all such obstetric injuries in this country since 1901 had been referred to skilled plastic surgeons who had cured them all. However, I am inclined to think that the value of the operation for the relief of women otherwised doomed to miserable existences has been lost sight of, for I cannot believe that Dr. Cummings and I are the only operators who have been unable to cure these terrible injuries of the soft parts. Yet the fact remains that only three cases have been reported in the last fifteen years.

CAUSE OF LESIONS GIVING RISE TO INCONTINENCE. In eight cases no cause was mentioned for the defects giving rise to the incontinence. Of the remaining 33 cases childbirth with or without instrumental delivery was given as a cause in 25 cases. In Keen's case, previously quoted, extensive sloughing followed an attack of typhoid fever while in Cumming's case a large part of the

vesicovaginal septum was destroyed by sloughing following a vaginal hysterectomy.

In four cases the operations had to be performed on account of the incontinence following removal of the urethra and portions of the bladder for malignant disease. Fortunately, primary carcinoma of the urethra is rare, but when it is met with one should not hesitate to make an extensive removal for fear of the resulting incontinences which can be subsequently overcome by the operative procedures under discussion.

Diphtheritic ulcer and gunshot wound were given as causes of the lesion in the two remaining cases.

Nature of the Defect. The nature of the lesions giving rise to the incontinence varied from vesicovaginal fistulæ with more or less complete destruction of the vesicovaginal septum to lesions in which the urethra was partially or wholly destroyed with fistulæ involving the rectovaginal septum. In 10 cases there were vesico-vaginorectal fistulæ while in 13 cases there was complete destruction of the urethra. In two cases in addition to other defects there were complete tears of the perineum.

A study of the cases will show that most of the operations were performed for most serious conditions of the soft parts after plastic operations had been tried and failed except in those instances where restoration of function was hopeless from the start because of loss of the vesical sphincter. This brings up the question of how many operations a patient should be subjected to when there is failure of plastic procedures. After a fair trial has been made and very little has been gained, the patient should have the procedure under discussion explained to her, as she may prefer it to repeated trials with very little hope of success. In a way, every case of the operation we are considering is a confession of failure. It is not and never will be an ideal procedure. At the most it is merely

a way out of a serious difficulty. Especially is it objectionable since it precludes copulation, a vital objection in the case of the married woman. On the other hand, where the parts are intensely irritated by urinary and fecal discharges, intercourse is just as much interdicted while in the one case the woman has great suffering and in the other she is able to have a fairly comfortable existence.

The Technic of the Operative Procedure. As the procedure in the great majority of cases is for the relief of urinary incontinence due to a vesicovaginal fistula, the formation of the latter as a part of the operation is reserved for those cases like my first one, in which the vesical sphincter is impaired by the removal of malignant tissue. It must be borne in mind that these artificially made vesicovaginal fistulæ must be large enough to allow for subsequent contraction. One should not hesitate to remove enough tissue from the vesicovaginal septum to prevent the consequences of such contraction, the formation of vesical calculi, which were reported in four cases. As a further aid toward preventing contraction the vesical and vaginal mucous surfaces of the fistula should be united by interrupted catgut ligatures.

The same warning holds true for the artificial rectovaginal fistula. It should be made just above the internal sphincter muscle, longer longitudinally than laterally but large enough to admit two fingers easily. The two mucous surfaces should be united by chromicized catgut or silk sutures. Spinelli worked out on the cadaver a somewhat elaborate technic for the formation of the rectovaginal opening, designed to prevent feces from being forced into the vagina and giving at the same time easy passage for the urine into the rectum. As a matter of fact such technic is unnecessary, since a study of the reported cases shows that a natural valve is formed after the making of a simple opening into the rectum so that feces do not flow

into the vagina, consequently, this accident need not be guarded against.

A drainage tube was used in the rectum in 9 cases. I very much doubt the necessity for its use and in another case I would dispense with it altogether, depending upon thorough paralyzing of the sphincter muscle by stitching and the occasional passage of the rectal catheter. A drainage tube even within the rectum causes considerable irritation, much more so if it be passed into the bladder by way of the rectal and vesical openings.

In 15 cases the operations were performed in two stages, the fistulæ, vesical and rectal being made first and the vagina subsequently closed. The advisability of the two-stage procedure will depend upon the nature of the case, being probably necessary in the presence of great irritation. However, in the majority of cases a one-stage operation will suffice and give just as good results.

Mortality of the Operation. Since the peritoneal cavity is not involved either in the formation of the vesicovagino-rectal fistula or in the closure of the vagina there should be no primary mortality connected with the operation. This is borne out by the study of the cases, since in only one instance, Maisonneuve's case, in which the patient was operated upon in 1851, did death occur directly from the operation. This patient died of a septic phlebitis, a result easily avoided today. One of Morisani's patients died on the eighteenth day of pneumonia, apparently unconnected with the operation. One of Rose's patients died ten months after the operation from nephritis which an autopsy showed did not result from the operation. Another of Rose's patients died about nine weeks after the operation, which was performed for incontinence following the removal of the clitoris, urethra, and the entire vesicovaginal septum. Death resulted from uremia due to pressure of malignant metastases upon the ureters.

Hence it may be concluded that the operative procedures are not dangerous, hence are justifiable for the relief of conditions which in themselves do not threaten life.

Results of the Operation. It is exceedingly difficult to secure primary union of the colpocleisis portion of the operation as shown by the fact that in only two instances did this part of the wound heal by first intention. The resulting fistulæ, however, heal rather readily after the application of caustics since there were only 6 cases of persistent fistulæ. That precautions must be taken against contraction of the rectovaginal opening is shown by the fact that such a contraction was mentioned in 9 cases.

Functional Results. Experimental work and a study of the reported cases show that the rectum can be used as a substitute for a urinary bladder without giving rise to rectal irritation. In not a single case of the forty-one was such irritation reported. The urine does not give rise to uncomfortable diarrhea, although the stools are somewhat softened by the urine. At times small amounts of liquid feces are passed with the urine. Usually, however, there are one or more formed stools a day in addition to the passage of the urine at frequent intervals. In 5 cases the patients were reported as being constipated. The length of time between the rectal urinary evacuations was mentioned in 23 cases. The urine was retained between two and three hours in 5 cases, while in one case each it was held for one hour, six, and between six and eight hours. It is very possible that highly concentrated urine would cause a certain amount of irritation of the rectum and lead to increased evacuations, but such a condition of affairs could easily be overcome by medicinal treatment.

Considerable interest centers about the menstrual function after the operation. Since most of the women are at the child-bearing age and are menstruating regularly at the time of the beginning of the incontinence, the menstrual

blood must either pass by way of the anus or be retained within the uterus. In 12 cases the women menstruated after the operation through the rectum without apparent inconvenience, while in 9 cases menstruation ceased after the operation without apparent cause unless it could be explained as due to the trauma giving rise to the vesical defects. Whether menstruation ceased or persisted there was no particular reason to fear colon infection of the endometrium from fecal contamination through the recto-vaginal opening. In the first place the vagina is usually free from feces, and, secondly, cases in which there are extensive rectovaginal fistulæ with a bathing of the cervix with fecal matter do not result in infection of the uterus.

The steps necessary to be taken when there is retention of menstrual blood from adhesions about the os have already been considered.

Ascending Renal Infection. There was absolutely no proof that the formation of the cloaca resulted in ascending renal infection. In my first case the urine was collected and examined and found normal. The only doubtful case, already mentioned, was one reported by Rose, in which the patient died of nephritis ten months subsequent to the operation. However, Rose had in mind the possibilities of ascending renal infection, and says distinctly in the report of the case that the autopsy showed that death was not due to anything connected with the operation. Again, let it be stated that this freedom from ascending infection is undoubtedly due to the fact that the ureteral orifices have not been interfered with, and that very few colon germs find their way into the bladder.

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A STUDY OF MODERN OPERATIONS IN HYPOSPADIAS FROM AN ANATOMICAL AND FUNCTIONAL STANDPOINT

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By the term hypospadias is meant a deformity of congenital origin due to the absence of some part of the lower or dorsal wall of the urethral canal. The upper or anterior wall of the urethral canal is always present and is represented by a shallow groove or channel on the under surface of the body of the penis. This groove extends from the opening of the urethra behind to the margin of the glans in front where it usually stops short. Occasionally it may be carried through the glans in the form of a fissure or the glands may even be tunneled in a more or less imperfect manner. Three varieties of hypospadias are usually described: (1) the *balanic or glandular* in which the urethral orifice opens just behind the margin of the glans penis; (2) the *penile* in which the urethral orifice opens at some point along the body of the penis in front of the scrotum; (3) the *perineal*, in which the urethral opening is behind the scrotum near the site of the central point of the perineum.

Balanic hypospadias (Figs. 1 and 2) is comparatively common. It has been estimated that it is present in at least 1 out of every 300 male children. The urethral opening is present on the under surface of the penis just behind the margin of the glans, in the place which would be occupied by the frenum, if it were present. The frenum and under surface of the prepuce are absent. The lateral and upper

surfaces of the prepuce are present and well formed but not redundant enough to cover the glans. The glans is flattened and expanded laterally. It is usually sharply bent at its attachment to the body of the penis so that its under surface is hidden from view. At times the bending of the anterior portion of the penis is so marked that the penis is bound down to such an extent as to be almost concealed by the prepuce and lateral scrotal tissues. The scrotum is usually well formed and the testicles are in their normal position. The orifice of the urethra may be in the form of capacious longitudinal slit or as small as a pin head. In some instances there may be no trace of a urethral canal in the glans. Usually it is grooved or fissured on its under surface. In other cases it may be tunnelled completely. As a rule the tunnel is incomplete with its orifice in front or behind.

Penile hypospadias is characterized by the presence of the urethral opening along the body of the penis behind the glans but in front of the scrotum. The glans shows all the general characteristics described in the balanic form. The prepuce is well formed and its lateral edges blend with the scrotal tissues behind resembling miniature labia. The penis is often strongly bent at its junction with the glans and the body is bound down to the scrotal tissues. The under surface of the penis in front of the urethral opening is occupied by a groove lined by mucous membrane, which stretches forward to the margin of the glans, where it usually ceases abruptly. The scrotum is usually well formed and the testicles have descended.

Perineal hypospadias is characterized by having the urethral opening situated far back, a little in front of the anus (Fig. 3). The scrotum is cleft. The testicles are often retained in the inguinal canal, in which event the scrotal tissues are poorly developed and resemble the labia majora of the female. These cases are often mistaken for hermaphrodites, or they may be brought up as girls until the age of puberty when male characteristics, such as growth of

hair on the face and breaking of the voice, reveal the true sex. The urethral groove conforms to the type met with in the penile variety. The lateral walls are well developed behind and the sides lie in contact for a considerable distance forming a potential canal. The condition is analogous to the phallic groove met with in the cloacal penis of the tortoise and marsupials. The body of the penis is usually strongly bound down and curved. The glans differs in no respect from the previous descriptions.

In addition to these three forms, a *penoscrotal* variety is described where the urethal opening is far back along the penile body (Fig. 4).

Etiology. The cause is to be sought in failure of union of the sides of the genital groove which is present on the under surface of the primitive penis. The urethral canal in man is developed in three distinct segments: (1) the proximal portion which corresponds to the adult prostatic and membranous portions of the urethra and which is derived from the urogenital sinus of the fetus; (2) the penile portion which occupies the body of the penis in front of the membranous part of the urethra and extends forward as far as the posterior margin of the glans penis; (3) the glandular portion which results from the tunneling of a special plug of epithelium which is developed on the under surface of the glans.

The various stages in the development will be followed more intelligently if we draw a comparison between the various stages passed through by the human embryo and the conditions present as adult anatomical characteristics in the lower animals. The diagrams shown in Fig. 5 represent the various types of cloaca met with in amphibia, *A;* in the tortoise, *B;* in a monotreme (echidna), *C;* and in a marsupial, *D*. It will be seen that in amphibia, *A*, there is no urogenital sinus, but that the bladder, rectum and Wolffian duct (ureter) open by separate apertures into the capacious cloaca. In the tortoise, *B*, it will be seen that the

rectum has shifted its position backward and opens into the upper and posterior part of the cloaca. Further, a constriction has occurred in the anterior and upper part of the cloaca, separating from off a bottle-shaped cavity (urogenital sinus) into which open the bladder and the Muellerian and Wolffian ducts. Into it also opens the ureter which is a new development. In the monotreme, echidna, *C*, the urogenital sinus, into which open bladder, ureter, Wolffian and Muellerian ducts, has become greatly elongated and opens into the upper and anterior part of the cloaca as in the tortoise. The rectum has approximately the same position. In marsupials, *D*, the urogenital sinus does not differ in any important particulars from that in echidna. The rectum, however, has migrated so far backward and downward that it opens into the cloaca very close to the cloacal membrane, *i. e.*, near the perineum. The cloaca is much less capacious than in *B* and *C*, and at its upper end the urogenital sinus and rectum enter by separate openings placed close together. If one compares these figures with the series of human embryos (Fig. 6) it is clear that *A*, of the human embryo series showing a section of a fetus of about twenty days is in the stage of adult amphibian development; that *B*, representing a fetus of about thirty-five days, is in the stage of an adult tortoise or monotreme; and that *C*, representing a fetus of a later age is in the stage of an adult marsupial.

Up to the present, we have traced the development of the urogenital sinus which becomes the permanent prostatic and membranous urethra. In order to understand the development of the penile portion of the urethra, it will be necessary to follow the stages in the development of a penis in the lower animals and its gradual evolution to the type found in the higher mammals. The following set of diagrams (Fig. 7) represent the stages seen in the evolution of the penis in the tortoise, *A*, in a monotreme (echidna), *B*, in a marsupial, *C* and in man *D*. In the tortoise and

echidna, the penis is completely intracloacal; in marsupials the penis is partly intracloacal; in man the penis is entirely extracloacal. In the tortoise (*A*), the urogenital sinus opens into the cloaca at the posterior end of the penile eminence. From this opening, the under surface of the penis is occupied by a longitudinal groove (phallic groove) which passes to its end. During copulation, this groove is converted into a canal by contact with the posterior cloacal wall. In echidna (*B*) the phallic groove has been converted into a canal except at its hinder end, where the urogenital sinus opens into the cloaca. In marsupials (*C*) the hinder end of the phallic groove in the penis has been transformed into a canal which is continuous with the urogenital passage. The urethra opens into the cloaca about half way along the body of the penis. The under surface of the organ in front of this opening is occupied by a deep phallic groove which passes almost to its end. In man, *D*, the whole length of the phallic groove has been transformed into a canal which reaches (in the illustration) to the posterior margin of the glans. Further, the rectal orifice and urogenital sinus have been still further separated from one another by the growth of the perineal body. A further comparison between *C* and *D* shows that in marsupials the penis is partly intra- and partly extra-cloacal, whereas in man the penis is entirely extracloacal. In man the migration of the rectum backward, and the downward growth of the urorectal septum which practically separates the cloaca into two cavities, forces the genital eminence into an extra-cloacal position. This is seen very clearly by a study of *B* and *C* (Fig. 6) in which the transition from *B* to *C* seems to have been effected by the growth downward of the urorectal septum *A*. In *C* the cloacal membrane *c m* is still present, separating the cloacal depression (ectodermal cloaca) from the primitive cloaca (entodermal cloaca. The urorectal septum is in contact with the cloacal membrane and has separated the urogenital sinus in front from the rectal passage behind. The urogenital

sinus has also sent a process into the genital eminence. At a later date the cloacal membrane breaks down and the urogenital sinus opens into the ectodermal cloaca; and still later with the further growth of the urorectal septum downward, the urogenital sinus opens on to the perineum.

The stages of development of the *penile urethra* can be followed easily from this point on (Fig. 8). In the perineum about the end of the seventh week, a circular fold (the cloacal or outer genital fold) can be seen *I*, *A*, which forms the boundary of the ectodermal cloaca. Within it, can be seen the genital ridge or eminence which is grooved on its under surface (cf. the tortoise). This eminence forms the penis or clitoris. The groove (phallic) passes backward as far as the opening of the urogenital sinus. In front it does not reach the end of the primitive penis, but stops just behind the glans. In *II*, (a stage about the end of the second month), the edges of the groove in the genital eminence, called urethral or inner genital folds *a*, *a*, have united in their posterior portions and in so doing have shut off the posterior (anal) from the anterior or urogenital part of the ectodermal cloaca. In front the groove is still open. In *III* (about the beginning of the third month) the posterior ends of the united inner genital folds *aa* have fused with the contiguous sides of the outer genital folds *AA* except behind where the anal opening *F* comes to the surface. The inner genital folds meet behind to form the perineal body. In front they meet on the under surface of the glans. Between these points the penile groove is still wide open. In this stage the male and female organs are alike. If the female type persists, the inner genital folds remain open as the labia minora. If the case develops up to the male type they unite to form the penile urethra. In *IV* (fetus about the tenth week) the inner genital folds (urethral) have united except just behind the glans. The outer genital folds (cloacal) have also united over them and by their fusion produced the median raphé of the perineum and penis. The outer

genital folds form the labia majora in the female and the scrotum in the male.

The *glandular portion of the urethra* is formed by a separate process. On the under surface of the glans a crest of epithelium makes its appearance. This becomes changed into a gutter (phallic groove) and finally by fusion of its edges it becomes transformed into a canal which in the adult and perfect condition unites with the penile canal behind. In *III* (Fig. 8) the glandular groove is shown unclosed and is continuous with the penile groove. In *IV* the margins of the phallic glandular groove have united, but the channel is not continuous with the penile urethra which ends just behind the glans, a condition quite common in the balanic type of hypospadias. Failure of regular canalization of the ectodermal plug that forms the glandular urethra is responsible for the numerous varieties of grooves and channels that have been met with in the glans, when the urethra opens behind it. A few of the most common types are shown in Fig. 9.

Indications for Operation. Cases of the *perineal variety* with undescended testicles are both sexually impotent and sterile. There can be no real reason, apart from sentiment, to advise an operation, because even if successful, it would accomplish nothing more than to enable the patient to urinate in a standing posture as other men do. On the other hand, where we are reasonably sure that sexual powers are likely to be present, the operation is not only justifiable but imperative. In the *balanic variety*, we may reasonably doubt the propriety of operating except in carefully chosen cases. There is abundant proof that coition, though hindered, is quite possible, and that impregnation is frequent. Cases in which the penis is reasonably straight and well formed should not be operated upon. Where there is much deformity from bowing, the penis should be straightened, and if necessary, a new urethral canal made. Surgical procedures in cases of *penile or perineoscrotal varieties* are always justifiable.

Suitable Age for Operation. The most suitable age is from the sixth to ninth year. The patients are then old enough to be controlled and to give material co-operation in the after-treatment; but they are not old enough to be troubled with erections from sexual irritation.

Operative Procedures. These may be considered under two headings: (1) those having as their object the liberation and straightening of the penis; (2) plastic procedures for the purpose of making a new urethra.

Straightening the Penis. In the balanic type with a moderate amount of bowing of the penis, it can be straightened by a procedure familiar to all surgeons in the operation of pyloroplasty. A transverse incision is made on the under surface of the penis just behind the glans and in front of the urethral opening. As the transverse cut is deepened it becomes transformed into an oval, or more strictly speaking in this position it becomes roughly kite-shaped, with the point toward the urethral opening (Fig. 10). If the sides of the kite-shaped area are now approximated, the line of suture will be vertical, and the bowing will disappear. In cases of severe bowing, this operation should be completed before any plastic work is attempted on the urethra. In mild cases we may continue with the plastic work at once. If the bowing is to be corrected completely, the transverse incision must be deep enough to divide every structure as deep as the corpora cavernosa. Complete liberation means a large wound and when the sides of the wound are approximated, the urethral orifice will be found to have receded from the margin of the glans to an alarming degree. It is, however, the most necessary part of the operation if a straight, useful penis is desired.

Making the New Urethra. It should be laid down as an axiom that no skin should be employed as a urethral flap which contains hair follicles, because serious trouble will follow sooner or later from phosphatic deposits on the hairs. Happily, there is plenty of skin free from hair that

can be obtained from the lateral aspect of the penis, while the hood of the prepuce is absolutely free from this objection. Skin flaps taken from the lateral aspects of the scrotum should be avoided.

It will simplify our description if we divide the operations into two classes: first, those on the balanic and anterior penile varieties, and second, those on the posterior penile and perineal.

1. *Operations on Cases of Balanic and Anterior Penile Forms of Hypospadias.* Two types of operation have been employed: (1) the employment of flaps obtained from the prepuce and the side of the penis, and (2) dissection of the urethra from its bed followed by its advancement through a tunnel perforated through the glans penis.

Flaps Taken from the Prepuce and Penis. There are two types of this operation. In one the pedicle of the single flap is above on the dorsum of the prepuce (Mayo); in the other the pedicle of the two flaps are below on the sides of the penis (Russell, Duplay).

The former operation, usually known as the Mayo procedure is performed as follows: (Figs. 11 and 12). First the penis is straightened by the procedure described previously, and the wound is allowed to heal completely and to consolidate. At the second operation, a capacious tunnel is made through the glans penis, reaching from its end to a point a little to one side of the urethral opening. Then a right-angled flap long enough to reach without tension through the tunnelled glans to the urethral opening is cut from the skin of the dorsal surface of the prepuce and penis. Its base is in front near the free margin of the prepuce, its apex is behind near the root of the penis. It must be wide enough to be rolled up into a little tube like a cigarette paper. After dissection it is rolled up with the skin surface inward and the edges are united with fine sutures of chromic gut. The tube is then dragged through the tunnel in the glans and its apex is stitched to a bed prepared for it in close contact with the

site of the urethral opening. Nothing further is done in this stage of the operation. Subsequently, when the tube has healed in its bed, the preputial attachment is severed. At a later operation the proximal end of the tube is united to the end of the urethra.

The latter operation (Russell, Duplay) is performed as follows. The penis is straightened at a previous operation. First the bladder is drained by inserting a self-retaining catheter through a perineal puncture. Then two lateral flaps are cut from the sides of the penis and prepuce. The bases are below and encircle the urethral opening. The apices are above on the dorsum of the prepuce. The flaps consist of skin and subcutaneous tissue. They are free at their apices and as far backward as the under surface of the glans, but from this point backward to the urethral opening the lateral margins are dissected up as little as possible to conserve the blood-supply. The lateral margins are then united together with fine chromic gut sutures and the mesial edges of the free ends of the flaps similarly fastened together. The tube which results is then pulled through a tunnel made through the glans penis as described in the previous operation, and its apex sutured in place. Fig. 10 will enable us to understand clearly the method of cutting the flaps. In the figures the apices of the flaps have been outlined on both the under surface of the penis and the dorsum of the prepuce. When dissected up the anterior end of the flap looks like a clergyman's stole.

Dissection of the Urethra from its Bed followed by Advancement through the Glans (Beck's operation). This operation has enjoyed great popularity on account of its apparent simplicity. It is performed as follows: An incision is made around the urethral orifice and if necessary a vertical cut is carried along the under surface of the urethra toward the perineum. The urethra with the spongy body is now dissected off from the corpora cavernosa in the form of a tube, until it is long enough to be drawn through a tunnel which

Fig. 1 Fig. 2.

Fig. 1.—Balanic hypospadias. Penis held straight and glandular fissure opened wide. Urethral opening a short distance behind the glandular margin.

Fig. 2.—Balanic hypospadias. Prepuce hooded, penis slightly bowed, scrotum well formed, testicles descended.

Fig. 3.—Perineal hypospadias. Pseudohermaphrodite.

Fig. 4.—Penoscrotal hypospadias. (White and Martin.)

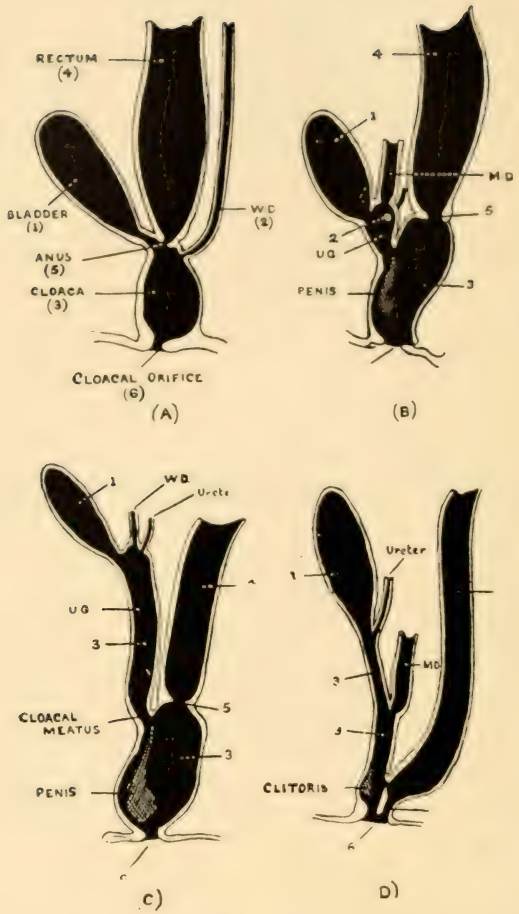


FIG. 5.—Diagrams to show the manner in which the cloaca is modified and the termination of the rectum transferred from the cloaca to the perineum in higher vertebrates. *A*, the amphibian form: *1*, bladder; *2*, Wolffian duct (ureter and vas); *3*, cloaca; *4*, rectum; *5*, intracloacal anus; *6*, cloacal orifice; M.D., Muellerian duct. *B*, form found in the tortoise. *C*, form in monotremes. *D*, form found in female marsupial. (From Keith's Human Embryology and Morphology.)

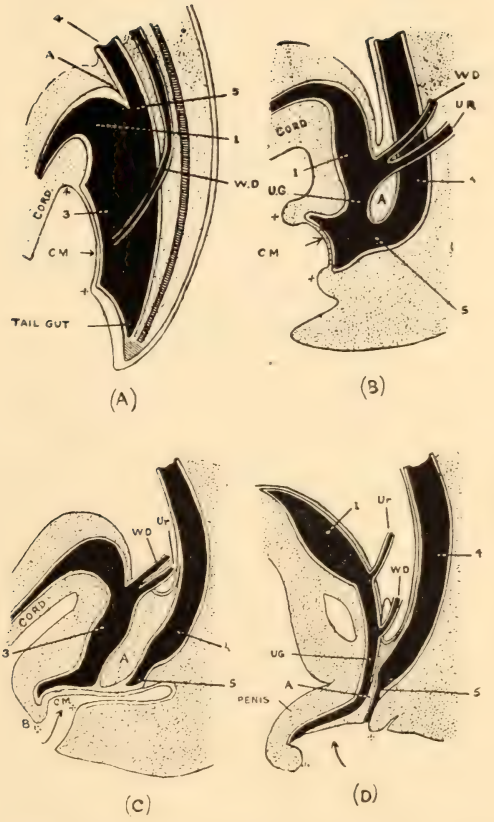


Fig. 6.—Diagrams showing the manner in which the rectum becomes separated from the urogenital sinus (entodermal cloaca) during development of the human embryo. *A*, from the human embryo, 4 mm. long—about twenty days (after Keibel). *B*, from human embryo, 11 mm. long—about thirty-five days (after Keibel). *C* and *D*, later stages of development; *1*, bladder; *2*, Wolffian duct (ureter and vas); *3*, entodermal cloaca; *4*, rectum; *5*, anus; C.M., cloacal membrane; U.G., urogenital sinus; *A*, mesoblast at junction of rectum and entodermal cloaca; B, penis, the limits of the perineal depression (ectodermal cloaca). (From Keith's Human Embryology and Morphology.)

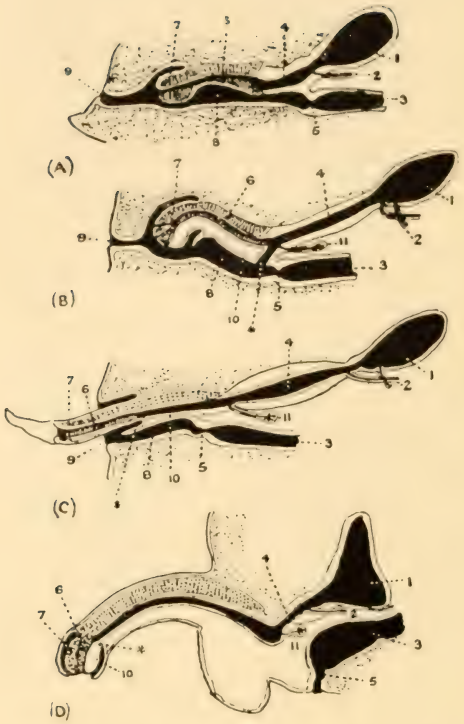


Fig. 7.—Diagram showing the stages in the evolution of the penis. *A*, stage seen in tortoise; *B*, stage seen in echidna; *C*, stage seen in marsupial (kangaroo); *D*, stage seen in man. The phallic canal is shaded. *1*, bladder; *2*, Wolffian duct (vas); *3*, rectum; *6*, phallic groove and canal; *7*, glans; *8*, cloaca; *9*, cloacal orifice; *10*, floor of phallic canal; *11*, Cowper's gland. (From Keith's Human Embryology and Morphology.) The asterisk shows the position of primitive orifice of urogenital sinus.

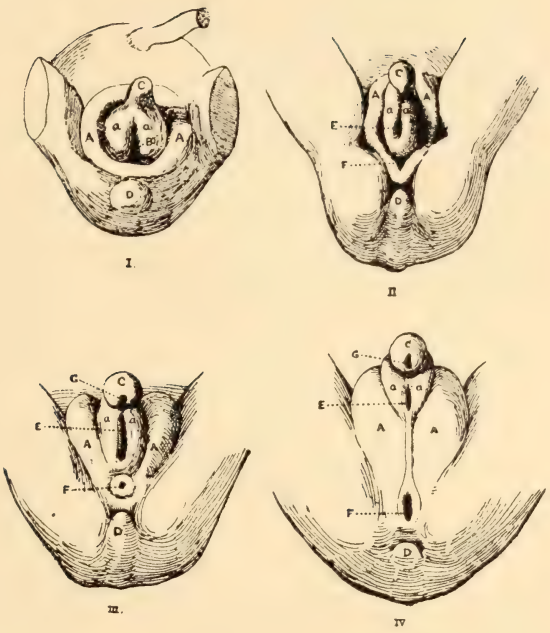


Fig. 8.—Diagrams showing the stages in the development of the human penis and perineum. (Drawings by Dr. Stanley Beale after figures given by Kollman, Keibel and Hertzog.) *I*, human embryo, 25 mm. long (about seventh week); *II*, 29 mm. long (about eighth week); *III*, 32 mm. long (about ninth week); *IV*, 45 mm. long (about tenth week). A, lips of cloaca (labia majora); B, urogenital orifice being carried to the surface between labia minora *a*, *a*; C, penis becoming extracloacal; D, tail; E, urogenital orifice; F, anus; G, meatus.

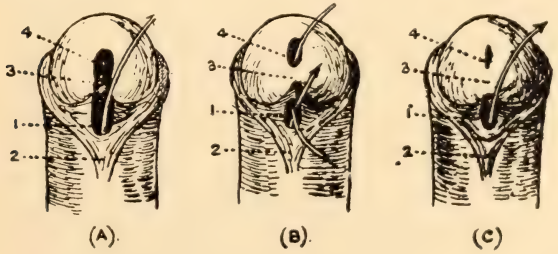


Fig. 9.—Diagrams showing three types of hypospadias. *A*, type in which the groove in the glans (phallic groove) is open, and urine passes by the urogenital orifice; *B*, in which the floor of the phallic groove is formed, but the urogenital orifice is unclosed; *C*, in which the phallic groove is unformed or obliterated and the urogenital orifice serves as a meatus. *1*, urogenital orifice; *2*, frenum preputii; *3*, phallic groove and canal; *4*, permanent meatus.

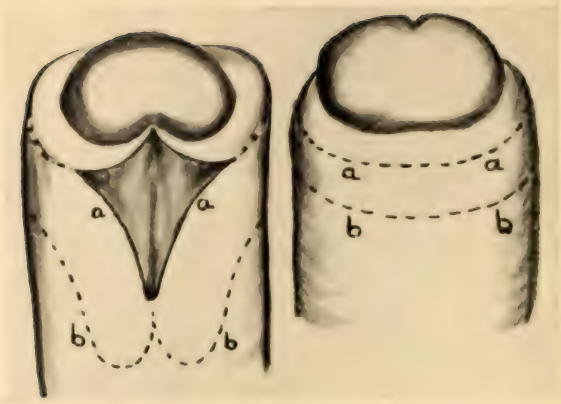
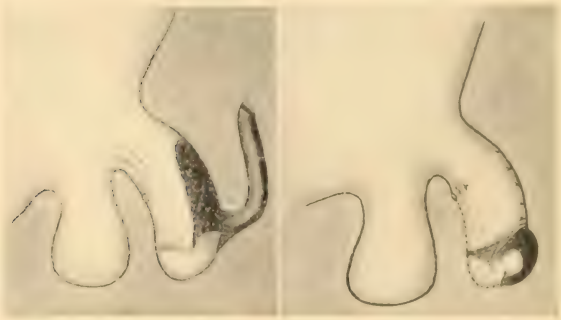


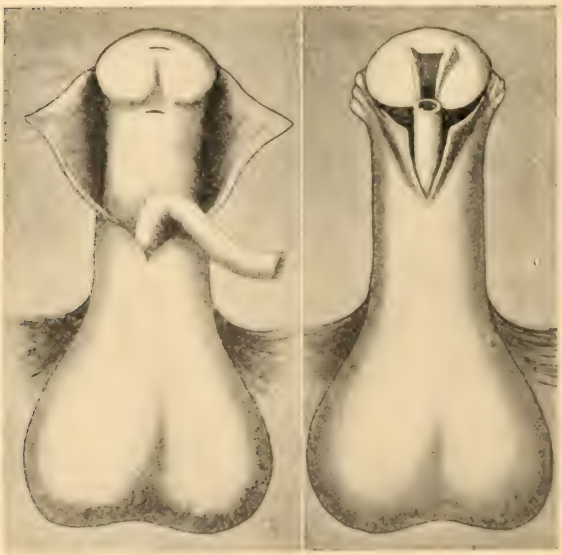
FIG. 10.—Drawing illustrating the Russell-Duplay technic. Full description in text.

FIG. 11 FIG. 12



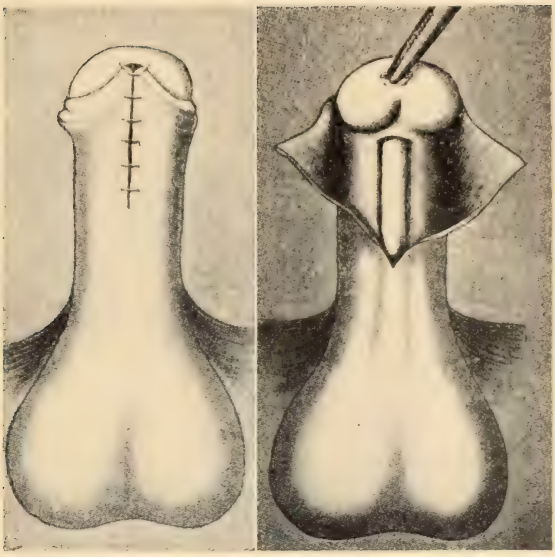
FIGS. 11 and 12.—Drawings illustrating the Mayo technic. Full description in text.

FIG. 13 FIG. 14



FIGS. 13 and 14.—Drawings illustrating the Beck technic.

Fig. 15 Fig. 16



Figs. 15 and 16.—Drawings illustrating the Beck technic.

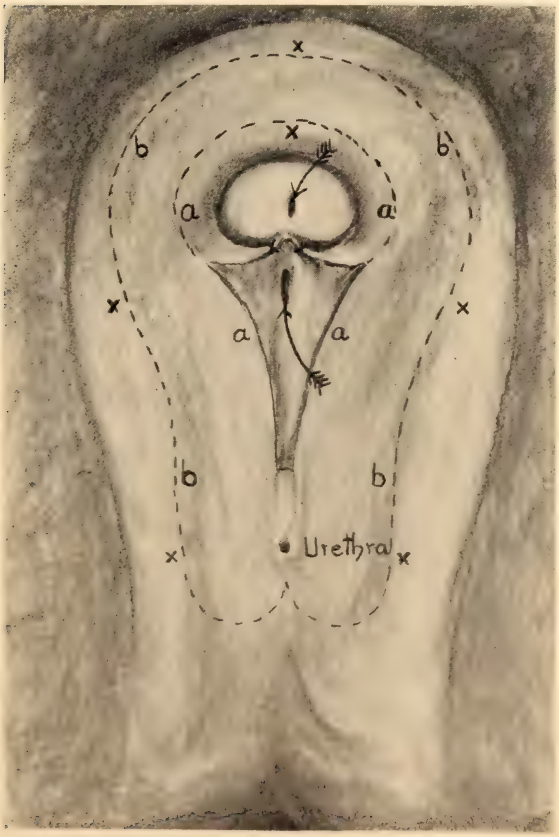


Fig. 17.—Author's modification of Russell's method.

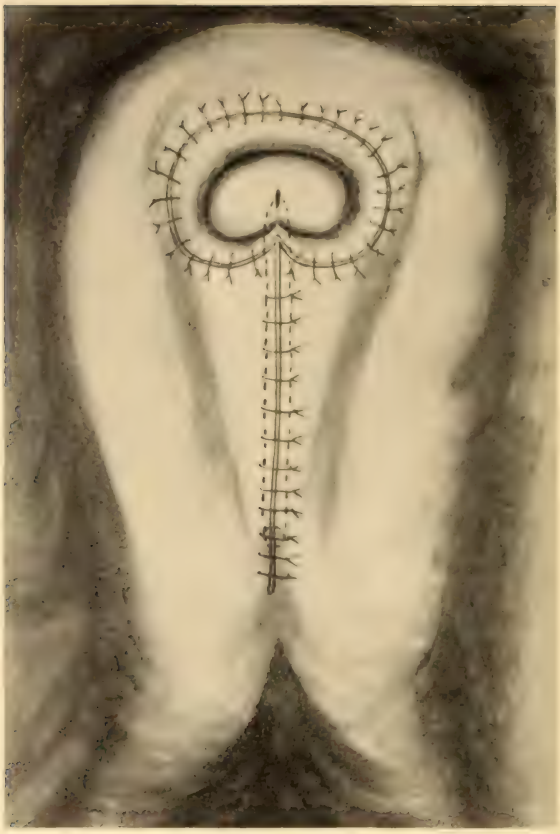


Fig. 18.—Drawing showing the final result after author's method.

Fig. 19.—Final result in Case 2.

has been made through the glans by a stab puncture. The advantages of the operation lie in its simplicity, and in the slight risk of failure from non-union or from necrosis of the urethral tube. It should only be attempted in cases of the balanic type, and in those varieties where the penis is straight and not bound down. If attempted in cases where the penis is strongly curved and bound down, dissection of the urethra will allow the penis to be straightened out, but if the urethra is brought through the tunnelled glans, the curve of the organ will be reproduced and a functional failure will result. The steps of the operation are shown in Figs. 13 to 16.

Of the operations described above preference must be given to those which employ the skin of the prepuce and penis as flaps. And perhaps the safest is the one where the flaps are taken from the dorsum of the penis and prepuce (Mayo) because they are better nourished at the base. In the flap operation with the pedicle below (Russell, Duplay) the defect can be remedied in a one-stage procedure, if a perineal puncture is made and the bladder drained. When the flap is taken from above, a two-stage operation is always necessary, because it is practically impossible to obtain union between the ends of the cigarette flap and the urethra at the first operation. Beck's operation must be reserved for easy cases with little penile deformity.

It is so important to keep the field of operation free from contact with urine that drainage of the bladder through a perineal or suprapubic opening is a necessity in every type of operation except Beck's. In one-stage operations and the second phase of two-stage operations, failure is almost certain to follow any attempt to drain the bladder through the new canal.

Perineal drainage can be used in cases of the balanic and most of those of the penile variety. A self-retaining catheter should be inserted into the bladder through the perineal puncture. Its end should be just within the vesical orifice. To prevent slipping, it should be stitched to the skin of the

perineum. At the same time the anterior urethra in front of the perineal opening should be drained with a small rubber gutter or a few strands of horsehair to remove any urine which leaks outward from the bladder alongside the catheter. This precaution is quite necessary to prevent troublesome complications, because after the catheter has been retained a few days there is an irresistible tendency for the urine to escape alongside it. In the perineal and perineoscrotal varieties suprapubic drainage is necessary. It is usually a very easy procedure. The bladder is distended with fluid and a puncture made into it with a large trochar and cannula. A catheter is passed into the bladder through the cannula which is then withdrawn. Care must be taken to make a number of large fenestræ in the catheter and not to allow the end to reach the region of the trigone where it would cause constant irritation.

B. Operations in the posterior penile and perineal varieties. In operating by ordinary methods at least three operations are required to effect a cure. In the first the penis is straightened; in the second the penile defect is closed except at the urethral orifice; in the third the urethral orifice is closed. In making the new urethra, the type of operation which gives excellent results is one in which the urethra is fashioned from lateral flaps which are taken in front from the prepuce and behind from the sides of the penis. If the urethral opening is very far back, scrotal tissue must be employed to a slight extent. The operation that has appealed to me as the best was described by R. H. Russell in the *British Medical Journal*, of November 17, 1900. Posteriorly, flaps are taken from the tissues on either side of the urethral groove and are fashioned according to the method of Duplay. In front they are taken from the sides of the penis and the dorsum of the prepuce. As performed by Russell the operation is divided into two stages. In the first stage, the penis is straightened and the urethral canal fashioned, but no attempt is made to close up the urethral opening. A few

months afterward, the posterior and anterior urethra is joined by a plastic operation on the urethral opening. I have modified the Russell method in some particulars and the following is a description of the operation as a one-stage procedure. Figs. 10 and 17 show the method of cutting the flaps. Fig. 10 represents an anterior penile, Fig. 17 a posterior penile variety. A transverse incision is made through the under part of the penis behind the glans (frenum?) and carried around the penis dividing the prepuce about one-eighth inch from the corona *a*, *a*, *a*, *a*. By deepening the transverse cut underneath the glans the penis can be gradually straightened. The liberated organ viewed from its under surface then looks like the drawing, the shaded area representing the raw surface, the shape of which is roughly triangular or kite-shaped. A capacious channel is now made through the glans by transfixing it with a narrow bladed knife from its dorsum to the middle of the broad area of the triangular wound. A second incision *b*, *b*, *b*, *b*, is now made in the skin of the penis beginning at a point about one-third to one-fourth inch to the lateral margin of the urethral opening. (If a one-stage operation is contemplated the incision begins about one-eighth of an inch behind the urethral opening and is curved backward and outward around the urethral opening before pursuing its lateral course.) It is carried forward parallel to the side of the urethral groove behind, and the margin of the raw triangular surface in front. It passes over the dorsum of the prepuce from one side to the other parallel to and behind the cut previously made and is carried down the other side of the penis parallel to the raw surface and the urethral groove to a corresponding point on the opposite side of the urethral opening. The distal part of this incision is parallel to and behind the first cut made through the prepuce for the purpose of liberating the penis, and both incisions result in fashioning a flap of prepuce which is shaped exactly like a clergyman's stole. The flap so outlined, which is about

one-quarter inch wide, is raised up, care being taken to preserve its vascular supply. It is not advisable to separate the outer edges of the posterior extremities of these flaps too extensively, from the penile bed, because the vitality of the whole flap will be imperiled. The skin surfaces of the flaps are now turned face to face and the corresponding edges united carefully from end to end with sutures. I have used chromic catgut (No. 00) for this purpose and have employed a continuous stitch reinforced by a few interrupted stitches, applied in such a manner as to turn the skin edges inward toward the lumen. Russell does not believe that it is necessary to stitch the edges together so carefully. He uses a few sutures to unite the edges of the anterior free part of the flaps. In the hinder part of the flap he uses no sutures in the inner edges, which he asserts will come together when the operation is completed. He fastens the outer edges together by the same stitches that are used to bring the margins of the penile skin together over the newly fashioned urethra. This method of suture did not please me because it brought the line of the urethral directly under that of the skin union, and any infection of the skin margin with failure in primary union, would be fatal alike to the urethra.

The tube formed in this manner is now drawn through the channel previously tunnelled through the glans and fastened in place by a fine point of suture. The final stage of the operation consists in burying the new urethra. This is done by uniting the margins of the skin of the sides of the penis to one another over the urethra. This is done from behind forward until the urethral tube is covered as far as the lower margin of the glans. From this point forward and over the dorsum of the glans, the preputial skin margin outside the "stole" flap is united to that left attached to the glans inside the "stole" flap. In Fig. 17 the parts marked by the letters *xx* on opposite sides of the penis and on the dorsum of the prepuce are brought together. The parts

corresponding to the middle *xx* on a level with the lower arrow are united with the prepuce (where the frenum would be) marked *xx*. The final result is represented in Fig. 18.

I have employed the Russell method of operating in 2 cases with excellent results.

In one, a boy of nine years of age, I succeeded in making a new urethra in one sitting. The urethral opening was situated in the posterior portion of the penis. The penis was tightly bound down and bowed. The bladder was drained by a catheter inserted into it through a suprapubic puncture. The operation was performed exactly as outlined in Figs. 17 and 18. The result was primary healing. The patient left my care at the end of two weeks with the suprapubic opening still draining. Unfortunately, I have never been able to trace the patient.

The second case, a boy aged seven years, was one of the perineoscrotal variety. The urethral opening was a little in front of the central point of the perineum. The operation was divided into two stages. In the first stage the anterior urethra was fashioned according to Russell's method. The bladder was drained by a catheter passed through original the urethral opening. Unfortunately, the part of the new urethra that was drawn through the glans died and the result was that the new urethra opened a little distance behind the glans. The second operation performed a year afterward was preceded by a suprapubic puncture and drainage. The perineal opening of the urethra was then closed by a procedure exactly like that employed for many vesicovaginal fistulæ. Afterward the anterior urethra was elongated by a plastic procedure, similar to that in the first operation, the flaps being taken again from the prepuce. As we could not get enough tissue to form a tube long enough to bring through the glans, we were content to fashion it as far as the posterior margin of the glans. The result was very satisfactory. The catheter drained the bladder perfectly for six days. After this a little urine would

escape along the urethra causing a considerable amount of pain. At the end of ten days it was removed and all the urine passed along the penis. The result was very gratifying. Urination was painful, but at the end of three weeks, the patient was discharged in excellent condition. I have heard since, five months afterward, that urination is free and although attended still by a little pain, the discomfort is gradually disappearing. In this case, although the urethra is not placed at the end of the glans, the penis is straight and of fair length. There are fair prospects of a useful organ resulting. Fig. 19 represents the condition of the penis at the present time. It is not an actual photograph but a composite drawing.

A case was recently under my care in a young negro, aged fourteen, where the plastic work on the anterior part of the urethra was ruined in two successive operations by the penis becoming erect during convalescence. The penis was strongly bound down and acutely curved. The urethral opening appeared to be placed about the middle of the body of the penis. The glans penis showed a slight phallic groove. There was abundant preputial tissue. The testicles had descended and there was a fairly well formed scrotum. At operation the bladder was drained through a perineal puncture. The penis was liberated by a transverse cut through the spongy body behind the glans and in front of the urethral opening. The resulting incision was deep and wide and the raw surface kite-shaped and of unusual length owing to the excessive cirvation of the penis. When the penis was straightened, the urethral opening was found to correspond with the root of the organ. Flaps were thrown up according to the method described by Russell. When applied together, the resulting tube was not long enough to reach through the glans without reproducing a considerable amount of curve. It was decided not to tunnel the glans, but to stitch the end of the tube to the under surface of the margin of the glans, as a straight long penis was more desirable than a long

urethra. On the second day an erection occurred which broke down the union of the anterior third of the wound. A few days later some urine made its way along the newly formed urethra and caused its posterior end to break down.

Five months later, the patient returned and I found the following condition: The urethral opening was represented by an oval aperture, about one-sixth of an inch long, at the root of the penis. In front of this was fully an inch of reconstructed urethra in excellent condition. In front of this again to the end of the penis, the urethra was wanting. At the second operation the bladder was drained by a suprapubic puncture. The posterior opening leading to the urethra was closed by the simple plastic procedure of circular incision followed by suture of the inverted skin edges. The anterior urethra was remade by flaps taken from the sides of the penis by the method of Duplay. No attempt was made to tunnel the glans penis. Convalescence was good until the third day, when an erection occurred and the wound immediately behind the glans broke down. The site of the posterior plastic work remained in good condition and healed completely. The final result was that we lost about half the length of the anterior plastic work. At present the penis is quite straight and long and the urethra opens about half an inch behind the glans.

A DISCUSSION OF THE DIFFERENT METHODS OF EXCLUSION IN THE TREATMENT OF EXSTROPHY OF THE BLADDER, WITH CASE REPORT

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When one is confronted with the duty of caring for a case of exstrophy of the bladder, and is seeking for the best method by which he may accomplish his purpose, he is immediately impressed with the multiplicity of operative procedures which have been recommended. While a student I heard a story of an applicant before a State Board who was asked, "What is the pathology of pertussis?" His answer was, "The pathology is as vague and indefinite as the remedies are numerous and worthless." As the years have passed the philosophy of his reply has appeared more and more impressive. Whenever the therapeutic agencies suggested for the treatment of any condition are numerous they are to a greater or less extent worthless; at least we may be sure that no one method has been preëminently successful, and so the variety of procedures which have been originated for the treatment of exstrophy of the bladder is sufficient proof that no one best method has been devised.

The condition is so rare that no one surgeon would ever have in his own care a sufficient number of cases to enable him to base an opinion on his own experience as to the

best operative treatment. The old operations were rarely successful, and even when the object of forming a cloaca was attained—usually after many plastic operations—the patient was little better off, because he was still incontinent. At the present time no operation should be undertaken which does not have urinary control as its main aim, and all of the modern procedures suggested, beginning with that of Maydl in 1892, have been in this direction, practically all of them utilizing the anal sphincter, diverting the flow of urine through the bowel. In some instances partial exclusion has been sought for, in others complete.

Your indulgence is asked while a brief description of some of the methods is put before you. The Maydl [1] operation is the best known, and has been done more frequently than any other. This consists of transplanting that portion of the base of the bladder containing the ureteral orifices into the sigmoid, and, of course, necessitates intraperitoneal manipulation. Lendon [2] and Peters,[3] the former in May and the latter in July, 1899, transplanted the ureters separately into the anterior wall of the rectum. Lendon states that he was led to adopt this method because he hesitated to risk infecting the peritoneum. Although this is usually known as the Lendon-Peters operation, Bergenhelm is probably entitled to priority, as he is said to have first performed it in 1896. Moynihan,[4] in 1906, giving credit to Peters for the extraperitoneal transplantation of the ureters separately, first inserted a large portion of the ectopic bladder into the anterior rectal wall. The Moynihan method differs little from the Maydl, except that he did extraperitoneally what Maydl did within the cavity. The fact that the insertion of the ureters into the bowel was followed in such a large proportion of cases by an ascending infection of the kidneys, led a number of surgeons to attempt to form a pouch from some part of the bowel which should be either partly or completely excluded

from fecal contamination, and into which the flow of urine should be diverted.

Werelius,[5] of Chicago, in 1911, suggested a two-stage operation; the first to consist of a division of the sigmoid seven inches above the rectosigmoidal junction, the closure of the distal end and the anastomosis of the proximal into the rectum, thus leaving an artificial bladder about six inches long, into which, in the second stage, a flap of bladder containing the ureters was inserted. In 1911 Makkas[6] reports a case operated on in two stages by an exceedingly ingenious method. At the first operation, section was made of the cecum at the origin of the ascending colon and of the end of the ileum; the four openings closed and an anastomosis made between the ileum and the transverse colon. The appendix was then brought out through a button-hole and its mucosa stitched to the skin. After this pouch has been rendered aseptic by irrigation through the appendix, a month later the base of the bladder, containing the ureters, was attached to it. Excellent results are claimed, the cecum acquiring a capacity of 300 to 325 c.c., but with imperfect continence. However, perfect control was obtained by leaving in a catheter provided with a plug. This method was originated by Verhoogen, to whom credit is given by Makkas.

In addition to the method of complete exclusion just mentioned, which Taddei's[7] investigations on dogs led him to strongly approve, there were two new methods presented before the Paris Surgical Society, and reported in its *Bulletins et Memoirs* for January 9, 1912, by Marion. One was that of Cuneo and the other the mode of Heitz-Boyer and Hovelacque. Cuneo's method comprises two stages:

1. The isolation of a loop of small bowel from the terminal ileum, to make the future bladder; the continuity of the bowel is reëstablished by ileocolostomy. The

excluded loop is closed at its proximal end and the distal one placed in the interior of the anal sphincter, from which the rectum has been stripped. The orifice of the loop is sutured to the anal margin.

2. In the second step the base of the bladder containing the ureters is implanted into the excluded loop.

In the Heitz-Boyer and Hovelacque method the rectum is completely excluded and utilized as a new bladder and the sigmoid brought down and sutured within the sphincter.

Blair,[8] at the Cincinnati meeting a year ago, suggested the implantation of the base of the bladder into the segregated lower end of the ileum, in the hope that the ileocecal valve would protect the ureters from ascending infection. The method of Soubotine and of others, by which the bladder is anastomosed with the rectum, might be brought to your attention, but enough has been said to give an idea of the number and variety of the methods which have been tried.

As to the results which have been obtained, which might guide one in a choice of methods, we find it difficult to secure accurate data on which to base just comparisons. For instance, practically no cases are reported as having been operated on by the Moynihan method, and while this appeals to one as a most rational procedure, it has not been proved by actual experience, so far as the records show, to be a better method than some of the others. The mortality following the Maydl operation is variously estimated in different reports. Morehead [9] gives 154 cases operated on by the Maydl plan, or some modification of it, with a death-rate of 28.5 per cent. Buchanan [10] states that in 26 cases of implantation of the ureters into the rectum (Bergenhelm, or as better known, the Lendon-Peters method) there were 3 deaths, or a rate of 11 per cent. It is but reasonable to presume that the mortality rate of the Maydl

operation will always be higher than when the Moynihan or any of the extraperitoneal methods is chosen, since peritonitis next to pyelonephritis is the most frequent cause of death. Orloff [11] reports 11 deaths in 56 cases of Maydl operations, and 4 of the 11 were due to peritonitis. It seems that about the same rate of ascending infection would take place whether the implantation was in the sigmoid or in the rectum. It would seem, also, from such reports as have been made, that the attempt to prevent ureteral infection by implantation into partially excluded loops has not accomplished this purpose, while such methods will necessarily be accompanied by a higher operative mortality.

The Cuneo and the Heitz-Boyer and Hovelacque procedures seem to fail to give sphincteric control which is at all satisfactory, and are to be held *sub judice* until the advantage of either is better proved. The method advocated by Verhoogen, and successfully practised by Makkas, supplies a splendid aseptic urinary reservoir under fair control, but would unquestionably be attended by a very high operative mortality. Verhoogen lost both of his cases.

Taking every factor into consideration, the conclusion is reached that in spite of the risk of ascending infection the Moynihan operation, or the direct implantation of each ureter separately into the rectum, offers us the best means of treating these cases. In the female the mechanical difficulty of the extraperitoneal operation would probably make the Maydl procedure the best. If the ureters are inserted into the bowel separately, undoubtedly the valve action of the ureter ends would be made more efficient by implanting them according to the method advised by Coffey or Stiles.

The case which I have to report is that of a boy, aged two years and eight months, admitted to St. Joseph's Hospital January 10, 1916. He was robust and unusually

well developed except for this defect. A point to which some importance might be attached was that his mother was forty-five when he was born. The following note is copied from the record:

"Over the hypogastrium at the pubis there is a raised rugous area slightly larger than a silver dollar in size. Near the lower margin two papillæ, one inch apart, appear, from which water (urine) is seen to come in jets at short intervals. Symphysis pubis absent (2½ inches). The mucosa of the bladder is continuous with the membrane lining, the furrow on the dorsum of the rudimentary penis, which consists of glans and corpus spongiosum, corpora cavernosa absent. Between the ureteral orifices there appear two small lobules, with a fissure between—each the size of one-half cow pea—which are taken to be the lobes of the prostate. No evidence of ejaculatory ducts. Upper ends of vasa not found."

On January 11 operation was done according to Moynihan's technic, the only variation being that a transverse instead of a longitudinal incision was made in the rectum, which facilitated the suturing of the bladder into the rectum—angle being sutured to angle and curved surface to curved surface. The bladder was carefully dissected, with guides in the ureters. The upper part of the bladder was trimmed away, leaving an area 1½ x ¾ inch, including the ureteral orifices. A No. 4 soft catheter, with end cut off, was introduced for two inches into each ureter and held in by a suture of No. 1 catgut. The finger of an assistant was then inserted into the rectum, pushing the anterior wall up into the wound, where it was incised transversely and the dissected area of the bladder sutured into the opening—mucosa to mucosa and muscularis to muscularis. The catheters were pulled out of the anus. The wound was loosely packed with gauze. Time of operation one hour and eight minutes. This is mentioned only

to prove that this procedure does not require an excessive length of time, whereas some of the reports of other methods state that three or three and one-half hours are required for the completion of one stage. The boy stood the operation well. The catheters came away, one on the third day and the other on the fourth day. The wound remained dry and filled in rapidly. On February 2 the defect in the abdominal wall was covered in with aponeurosis, the pared skin edges, both of the wound and of the furrow in the penis, approximated.

The subsequent history is obtained in a letter, from the patient's mother of December 1:

He had an attack of enterocolitis in the summer, but has been perfectly well for three months, and in her words, "He is as fat as a pig now." The urine is controlled in the daytime, but passes often, never being held for much more than an hour, and at night there is continual incontinence. Whether he can obtain better control as he grows older is problematical. If he does not I think we can increase the sphincteric action by shortening the levateres ani, as suggested by Lerda.

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DISCUSSION ON THE PAPERS OF DRS. PETERSON, THOMPSON AND MALONE

Dr. Charles H Mayo, Rochester, Minnesota.—The three papers preceding could not have been better placed. Dr. Peterson's report of the percentage of successful union of the bladder and rectum is interesting and reminds us of the old cloaca of early life. The method has worked out very successfully for the reason that the ureteral openings were not interfered with. They were normal, and, moreover the bladder, contracted, which gives double muscular control of the outlet of the ureter. However, if the condition was ureterovaginal fistula it would be a different matter to attach the upper vagina to the rectum, as it would lead to trouble in the ureter that was leaking, while the other would carry on the work. It would necessitate the removal of the kidney on the side the fistula was on.

The question of removal of the bladder, and various methods of dealing with exstrophy, is a most interesting one. I have taken out the bladder a good many times in cases of exstrophy in patients of all ages, also in carcinoma of the bladder and in carcinoma of the bladder secondary to hysterectomy for cancer of the uterus. The Coffey technic of transplanting the ureters into the rectum was followed. In this technic, as you know, the incision passes through the peritoneum, down close to the mucosa which is opened below the lower end. Thus the tube is incorporated just behind the mucous membrane, and it operates exactly as nature empties all her ducts. The ureter runs five-eights of an inch between the mucous membrane and the outer wall of the bladder, and the common duct runs three-quarters of an inch to an inch and a quarter. Nature never really empties a duct directly into a viscus. Even the ileocecal valve tries to follow out the type of angular opening.

In cases of the Maydl operation there is a transplantation of a non-innervated section of the bladder, and immediately the saving factor in the Peterson operation is lost. As long as innervation is correct, the ureteral opening will take care of itself. When the Maydl operation is reversed and that section of the bladder attached to the rectum, the nerves are destroyed and the mortality is increased. The 50 per cent. mortality primarily was associated with that operation because, while

the transplantation is mechanically right, the tissues are devitalized and the operator is exposed to all the trouble of direct transplantation of the ureter which he has tried to avoid. Therefore, if the ureter is found widely dilated, as in carcinoma cases, I should think it would be best to bring the ureter to the surface in the loin and not try to bring it into the bowel. The widely dilated ureter cannot be controlled with the Coffey method. It will be over-controlled and there will be obstruction.

My first case of loin transplantation was done nine years ago. The man is doing farm work and is perfectly well. He wears rubber cots with tubes which fit nicely over the ureteral openings.

In one case I removed the entire bladder for carcinoma, drawing the ureters down under considerable tension, attaching them to the urethra just behind the pubic bone. The patient did very well for two years with no control, but with an apparatus that could be utilized for collecting urine. Then there was infection, first of one kindey, then the other, and the patient died within fourteen days.

In experimental work if one ureter is badly damaged and the other kidney is all right, the quickest method of dealing with it is to ligate the ureter on one side. This will kill the kidney immediately without distending it. A kidney will not become distended unless there is intermittent partial obstruction.

In the experimental transplantation of both ureters at one time, the mortality is high. If one is transplanted, and at the end of two weeks the other is transplanted, there is very little trouble.

We have not had any primary deaths in operating on such patients. I had one death some time afterward in a case of carcinoma in which the uterus and bladder were removed and the rather largely distended ureters were transplanted into the rectum. This was a mistake. They should have been brought through the skin. The skin and kidney are much alike in their power of elimination. In an operation on these cases, putting in one ureter, if a patient should become uremic he is then stupid and dull and it takes him a week to get over it. The patient is having a Murphy drip of urine, but the second ureter produces no trouble at all. These patients become immune to it.

I have seen several cases in which the diverticulum of the sigmoid perforated into the bladder, admitting gases and a little fecal matter, but the kidney has never been infected. In considering the various operations I should say the Maydl operation

is not worth while, theoretically, transplantation is done, nature is wonderfully protected in its muscular control in the ureter. There must be innervation.

The method of Stiles is really taken from the Russians or Poles. A surgeon in Russia, up to five years ago, had removed the uterus for carcinoma in sixty-three cases in which the growth was attached to the bladder, with a mortality of 50 per cent. The operation included the removal of the ovaries, the vagina and the bladder, and transplantation of the ureters into the rectum.

Dr. Charles R. Robins, Richmond, Virginia.—The subject of kidney infections is a most interesting one, and I have been quite interested in it for several years, having followed the literature of the subject very carefully. One of the best articles I have ever read on the subject is by Hugh Cabot, which came out a few months ago. Cabot takes the ground that ascending infection of the kidney is an extremely uncommon thing, and in his paper he draws attention to a series of experiments instituted by Braasch, of the Mayo Clinic, in which he demonstrated it was a very difficult thing to produce. I should imagine that when we have the urinary tract coupled up with the intestinal tract, if ever there was going to be ascending infection it would take place under those circumstances, and yet it is perfectly possible to believe that it does not take place even then. Cabot has got a most complete analysis of a very large number of cases in which he demonstrates that the infection is hematogenous in all of these cases; that in the coccal infections the infection takes place in the kidney substance, and that in the infection with colon bacillus it takes place in the collecting tubules and manifests itself in the pelvis of the kidney. I am convinced, from what small experience I have had, that this is the case, and that the colon bacillus is frequently excreted by the kidney without causing pathology. For instance, if we get constipated, if we get any unusual condition of the intestinal tract, I believe we may excrete under these conditions a large number of colon bacilli without knowing we are doing it and without causing any change in the structure of the kidney or pelvis at all. But if we have predisposing causes for the infection then the colon bacillus may cause pyelitis and other conditions. I am asking information because I have not done enough work to have definite information, but it occurs to me, in view of what Dr. Cabot says on the subject, that it is perfectly possible that

we have a predisposing cause of infection in these cases in the establishment of a ureteral stricture. Dr. Hunner's paper has shown us how ureteral stricture may predispose the kidney to infection.

In all these various types of operation we have had under discussion, it is possible the ureter going into the intestinal tract by whatever method we may adopt may eventually produce a stricture or some condition which will dam back urine and make it more susceptible to colon bacillus infection which comes by the hematogenous route. That explains why it is we do not have these infections right away, because the stricture forms slowly, diminishes the resistance of the kidney, and at some time in the future a storm of bacteria will cause infection.

When the essayists conclude their discussion I would like to have their views on that point.

Dr. Peterson (closing on his part).—These papers have been very interesting to me. I do not quite grasp the point made by Dr. Mayo regarding ureterovaginal fistula treated by the method outlined in my paper. I imagine, so far as results are concerned, in cases of inoperable ureterovaginal fistula that no renal infection would follow opening of the rectum and closure of the vagina.

He is perfectly correct in stating that in the operation of uretero-intestinal implantation both ureters should not be transplanted into the bowel at the same time. The reason is very apparent, as Dr. Robins has brought out: almost invariably even with the most improved technique there will be more or less of a stricture of the ureter at the site of the implantation with the usual result of ascending pyelonephritis. If both ureters be transplanted at the same time, the patient may not be able to overcome the resulting infection and death may ensue. If only one ureter be transplanted into the bowel, while pyelonephritis may result the patient may survive with a contracted kidney plus a sound kidney. If the contraction of the kidney be not too severe the second ureter may subsequently be transplanted and the patient survive, at least for a time, with two damaged kidneys. Since it is impossible to predict how much kidney infection will follow implantation of a given ureter, it is always unjustifiable to implant both ureters into the bowel at the same operation.

I am perfectly aware that the operation I have outlined in my paper is not ideal surgery. In one sense it is a confession

of defeat, but at least it is a good way out of a bad situation. After such operations upon patients whose lives have been miserable on account of the constant dribbling of the urine from the vagina, the women are made comfortable and are well content in comparison to their former condition.

Dr. Malone (closing).—I might say what Dr. Peterson has said in regard to his paper, that my paper had to do with a very deplorable condition, and when these cases of exstrophy of the bladder come to us we have got to do something for them. While we know that there is not a perfect operation we can do, we simply have to relieve them of their unfavorable condition the best we can.

There is one point that comes to me which has been touched on today, and that is in regard to the preservation of the ureteral orifice in the implantation of the cut end of the ureter into the bowel in such a manner as to imitate the normal ureteral passage through the bladder. Dr. Peterson in his work, and he has repeated it in his conclusions today, emphasizes the matter of preserving this obliquity of the entrance of the ureter into the bowel when it is transplanted. Dr. Mayo suggests that when the base of the bladder is transplanted with the ureters, that ascending infection occurs because of a lack of innervation. It has occurred to me that in these cases of exstrophy of the bladder ascending infection occurs more rapidly because of the patency of the ureteral orifice before transplantation. In my own case the ureteral orifice was very large. It admitted readily a No. 4 soft catheter. Dr. Blair tells me in his case the same thing is true. In the literature attention is called to the fact of the wide opening of the ureteral orifice. It seems to me, if in a large proportion of these cases we have these large ureters, we have in that fact sufficient reason for the ready entrance of the bacteria into the ureters rather than the fact that we deprive the base of the bladder of some of its nerve supply when we transplant it.

ACUTE AND SUBACUTE PERFORATIONS OF THE STOMACH AND DUODENUM AT THE MASSACHUSETTS GENERAL HOSPITAL

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The following paper is based on the acute and subacute perforations of the stomach and duodenum at the Massachusetts General Hospital, 104 in number, occurring in 103 patients. Cases of chronic perforation, walled off by adhesions, showing neither acute peritonitis nor abscess formation, have not been included. This series includes the total experience of the hospital from the first operation in 1896 through 1915, a period of twenty years, which may be subdivided into two periods of ten years each, the first including the development of diagnosis and operative measures, the second a more or less standardized treatment. Both periods are included, for although the first period may not give a true idea of the present operative results, yet it contributes to a consideration of incidence and symptoms, and provides a few surviving cases in which the late results are known.

The purpose of the paper is to consider the results of operative treatment, with special attention to the advisability of a primary gastro-enterostomy as well as closure of the perforation, although the statistics afforded by this group of cases have also been included.

There were 90 operations for perforation in 89 cases, one duodenal case reperforating at the end of three months. These operations were performed by 23 surgeons, the largest number falling to any one man being 11; 14 patients died without operation. Of this latter group of 14 cases, 5 were moribund on admission, operation was considered inadvisable in 3, and error in diagnosis occurred in 4 cases, while 2 cases gave no clinical evidence of perforation, which was discovered unexpectedly at autopsy. The clinical diagnosis was confirmed by autopsy 11 times in this group, 5 of the cases were gastric and 6 were duodenal. It is fair to assume, from the clinical history and examination, that the remaining cases also had gastric or duodenal perforation.

Of the operated cases, 76 showed an open perforation without walling off, 6 a diffuse peritonitis, although the perforation appeared sealed at the time of operation and 8 a more or less local abscess.

The operative cases were classed at the time of operation as either gastric or duodenal. These, together with the non-operated cases confirmed by autopsy, give a group of 100 patients, of which 43 had gastric and 57 duodenal perforations. This grouping, especially in the earlier operated cases, is necessarily somewhat inaccurate; nevertheless, of 8 cases classed as gastric coming to autopsy following operation, 6 were gastric and 2 duodenal, while all of the duodenal group coming to autopsy following operation were found to be duodenal. Consequently, I feel that although the gastric group may include duodenal cases, nevertheless there is sufficient preponderance of gastric cases to make any difference between the two groups real and not apparent. Since the gastric and duodenal perforations are by no means identical in clinical course or amenability to treatment, these two groups are analyzed

separately, except where the location of the perforations was indifferent to the fact considered.

In sex there is a marked difference between gastric and duodenal groups. The gastric cases include 24 men and 19 women, or 55.8 per cent. of men. The duodenal cases include 54 men and 3 women, or 94 per cent. of men.

The average age of gastric cases is 33 years, of the men 36.8, of the women 27.7 years. The youngest was 18 and the oldest 72.

The average age of the duodenal cases in men was 33.4 years. The youngest was 21 and the oldest 67.

Arranged by decades:

	Gastric.		Duodenal.	
	Men.	Women.	Men.	Women.
Under 20	1	1	..	..
20 to 29	3	11	13	2
30 to 39	3	3	16	..
40 to 49	7	1	13	..
50 to 59	5	1	9	1
60 to 69	4	2	3	..
70+	1	..	..	..
	24	19	54	3

The striking thing from these figures is the predominance of duodenal perforations in men and the occurrence of gastric perforations in women particularly between 20 and 30. Both types of perforation in men are well spread out through middle life, the duodenal occurring slightly earlier than the gastric. Given an acute perforation in a woman, these figures would suggest that it is six times as likely to be gastric as duodenal.

Perforation was in all instances, as far as observed, single. The location of the perforation was determined by autopsy in 17 duodenal and 11 gastric cases, and approximately noted at operation in 24 gastric and 29 duodenal.

The gastric perforations found at autopsy were located as follows:

Anterior wall—8 cases:

1 anterior wall, not specified.
1 anterior wall near lesser curvature 2 cm. above pylorus—1 2 cm. above pylorus.
1 anterior wall of stomach.
1 anterior wall 3½ cm. above pylorus, in anterior part of saddle ulcer of lesser curvature.
1 anterior wall 10 cm. above pylorus.
1 anterior wall 10 cm. above pylorus.
1 anterior wall of lesser curvature near middle of stomach.
1 anterior wall, middle of stomach, near greater curvature.

Posterior wall—3 cases:

1 posterior wall at pylorus, perforating anteriorly through lesser omentum.
1 posterior wall, upper part of lesser curvature.
1 posterior wall, midway between greater and lesser curvature, 7 cm. from esophageal opening.

The location of the gastric perforations observed at operation, but not confirmed by autopsy, was stated as follows:

Anterior wall—22 cases:

10 near pylorus.
4 lesser curvature, near pylorus.
1 middle of lesser curvature.
2 high on lesser curvature.
2 near cardiac end.

Posterior wall—2 cases.

These figures show the predilection for the anterior wall near the pyloric end and along the lesser curvature to be expected. Perforation on the posterior wall occurs sufficiently often to be a possibility worthy of consideration.

Location of duodenal perforations as shown by autopsy cases was:

Anterior wall, superior aspect—5 cases:

4 anterior superior aspect, immediately below pylorus.

5 anterior superior aspect, 1 cm. below pylorus.

1 anterior aspect, 1.5 cm. below pylorus.

1 superior aspect.

Posterior wall—2 cases:

The greatest distance noted below the pylorus was 1.5 cm.

Operative findings as to the location of the duodenal perforations not confirmed by autopsy were stated as follows:

First part, unspecified—12 cases.

First part, anterior wall—8 cases.

First part, superior aspect—4 cases.

First part, inferior aspect, 1 case.

Anterior wall, eight fingers below pylorus—1 case.

Posterior wall, first part—2 cases.

Posterior wall, upper second part—1 case.

These figures emphasize what a small area of the duodenum is usually penetrated by these ulcers, and the great vulnerability of a point on the anterior superior aspect, within 1 or 2 cm. of the pyloric ring. A common type of lesion at autopsy was a transverse ulceration close to the pylorus, involving the posterior and superior wall of the duodenum, and perforating at its anterior end through the anterior aspect of the duodenum.

The process tended to become localized about equally in both gastric and duodenal cases. The omentum appeared to close or partly close the perforation five times in gastric cases. This was not noted in the duodenal cases. In these when apparent sealing took place it was due to fibrin or adhesion to neighboring organs.

Many cases gave at the time of perforation a history of antecedent indigestion. This was considerably more frequently true in the gastric than in the duodenal cases. These symptoms may be classified in three groups: (1) digestive symptoms suggestive of ulcer; (2) digestive symptoms too indefinite or too slight to suggest the source; (3) no digestive symptoms whatever. In 33 gastric cases, symptoms suggestive of ulcer 49 per cent., indefinite digestive symptoms 36 per cent., no digestive symptoms 15 per cent. The duodenal cases showed digestive symptoms suggestive of ulcer 16 per cent., indefinite digestive symptoms 54 per cent., no digestive symptoms 30 per cent.

Duodenal perforations consequently appear more likely than gastric to occur without any previous warning in the way of digestive symptoms. In only a small proportion of duodenal cases is the history previous to perforation sufficiently definite to be an aid in differential diagnosis. In gastric perforations, however, the previous history would appear a definite help in about one-half of the cases.

Premonitory symptoms preceding perforation occurred in a considerable number of cases in the form of definite increase in pain, tenderness, or distress following eating. The exacerbation of symptoms usually preceded perforation by three or four days, rarely as much as two weeks, and is probably attributable to peritoneal irritation from thinning of the ulcer base.

The onset was sudden in 90 per cent. of the cases. Occasionally there was a sense of something giving away. The pain was described as sharp, knife-like, agonizing, excruciating, prostrating. In contradistinction to the pain of appendicitis, which is usually first general and then becomes local, the pain in perforation tends more to be local at first, becoming more diffuse with the spreading of the extravasated fluids. The commonest location was in the epigastrium and right hypochondrium. The principal

tenderness corresponded in general with the principal pain. In duodenal cases the greatest tenderness was referred particularly to the right side, principally the right hypochondrium, but frequently extending down the right flank into the right iliac fossa. In gastric cases the pain and tenderness, although usual in the epigastrium and on the right, might show its maximum on the left and extend down the left flank. The greater tenderness was on the left in about 15 per cent. of the gastric cases.

Spasm was commonly general, frequently board-like in character, the greatest spasm usually corresponding in location to the greatest tenderness.

Occasional vomiting occurred in 83 per cent. of the cases. It was usually not a prominent or persistent symptom.

Elevation of temperature was usually slight in this series. It was normal or subnormal on admission in 35 per cent. of the cases. The highest temperature on admission was 103 degrees.

The leukocyte count on admission was noted in 62 cases. The minimum count was 6000, the maximum 56,000, both occurring in fatal cases. The average count of the fatal cases was 18,500, of those recovering 19,800. The white counts in both series, those recovering and those dying, showed very similar variations, and no general conclusion as to a prognostic value in the white count could be drawn.

Liver dulness was said to be obscured in 15 cases and diminished in 11 more. While this physical sign may occur it seems that these figures tend to exaggerate its frequency. Its presence in a few instances is of little value in the diagnosis of the average case.

Distention was present only as a late development. The abdomen was usually flat, occasionally retracted. When present it is a bad prognostic sign; 18 cases in which more

than slight distention was noted gave an operative mortality of 72 per cent.

At the present time the matter of diagnosis needs little discussion. The fact that there is a surgical emergency demanding operation is reasonably clear in all cases.

Confusion with appendicitis occurs especially in the duodenal cases, in which the gravitation of the duodenal contents down the lumbar gutter between the ascending colon and the right flank may give rise to an apparent maximum of tenderness and spasm in the right iliac fossa. In such cases at operation the character of the peritoneal fluid, usually thin and odorless, and considerable in amount, and the appearance of the appendix, which if abnormal at all shows only superficial injection without tenseness or necrosis and possibly adherent fibrin, which it shares with other peritoneal surfaces, should make exploration of the stomach and duodenum an obvious necessity.

Disease of the gall-bladder, which gives sufficient disturbance for confusion with perforated ulcer, should be obvious on exposure of the gall-bladder. At operation the same incision fortunately gives access to the duodenum and pyloric end of the stomach. A probable preliminary diagnosis of appendicitis, as shown by the location of the first opening in the peritoneum, was made in 31 per cent. of the duodenal cases. In only two cases coming to autopsy, however, was the source of the peritonitis apparently not suspected at operation. This confusion occurred principally in the earlier cases. In the gastric cases the first peritoneal opening was less frequently low.

Of 90 perforations in 89 cases treated by operation 32 died, a general mortality of 35.5 per cent. If we include 14 cases dying without operation the total mortality of the cases admitted is 44.2 per cent.; 8, all of which recovered, showed a more or less local abscess at the time of perforation. This leaves 82 cases, 48 duodenal and 34 gastric,

which showed a diffuse peritonitis at the time of operation. Of the duodenal cases 15 died, a mortality of 31 per cent.; of the gastric 17 died, a mortality of 50 per cent. These figures, including a period of twenty years, do not give a fair idea of the mortality of perforation with diffuse peritonitis at the present time. If they are divided into two periods of ten years the second period will more nearly represent the present mortality.

From 1896 through 1905 inclusive the gastric cases were 11 in number, of which 7 died and 4 recovered, a mortality of 64 per cent. The duodenal cases were 7 in number, of which 5 died and 2 recovered, a mortality of 77 per cent.

From 1906 to 1915 inclusive there were 23 gastric cases, of which 10 died and 13 recovered, a mortality of 43.5 per cent. The number of duodenal cases was 41, of which 10 died and 31 recovered, a mortality of 24.4 per cent.

The following table gives an analysis of the mortality for five-year periods:

	Gastric.			Duodenal.		
	R.	D.		R.	D.	
1896 to 1900	1	3	75.0 per cent. died	..	2	100.0 per cent. died
1901 to 1905	3	4	57.0 per cent. died	2	3	60.0 per cent. died
1906 to 1910	10	6	37.5 per cent. died	12	5	29.4 per cent. died
1911 to 1915	3	4	57.0 per cent. died	19	5	20.8 per cent. died
	17	17	50.0 per cent. died	33	15	31.2 per cent. died

This table shows a steady lowering of the mortality of duodenal perforations, while that of gastric perforations remains high. It also shows an increasing frequency of duodenal as compared with gastric ulcers, probably due in large measure to more accurate localization. In spite of any such error in localization it would seem assured that gastric perforation carries a considerably higher mortality than duodenal.

The following reasons may partly explain this difference. Duodenal perforations occur in a limited area while

gastric perforations may occur over a wide extent of stomach. A duodenal perforation may therefore be found more quickly and with less manipulation. The possible greater accessibility of duodenal perforations may also favor ease and rapidity of closure. The pyloric sphincter may lessen the outpouring of gastric content through a duodenal perforation, the leakage from which might be limited chiefly to the duodenal contents. The anatomical situation of the duodenum and its relation to surrounding structures may limit the dissemination of fluid from the perforation to a greater extent than in perforation of the body of the stomach.

The chief factor in mortality in cases with diffuse peritonitis is distinctly the elapse of time from perforation to operation. Thus the elapse of time after perforation in 27 duodenal cases recovering was 14 hours, in 11 fatal cases, 25 hours. The lapse of time in 15 gastric cases recovering was 17 hours, in 16 fatal cases 19 hours. Cases which showed a localization of the peritonitis have not been included in these figures.

In this connection the cases which died in the hospital without operative interference are of some interest. Of 14 cases dying without operation, 8 gave a sufficiently definite history to enable one to estimate the duration of life from the time of perforation to the time of death. The longest survival from perforation to death was 51 hours, the shortest 24 hours, and the average 32 hours. Consequently, if a case is operated on toward the end of the second day the margin of resistance is naturally extremely small. One may conclude in cases that survive much beyond the second day that localization of the peritonitis had occurred, aided presumably by sealing of the perforation or by its small size or position.

Age is an important factor in mortality. In considering this point I have taken only the second decade, since technical errors are less important as a factor in mortality in

this period. The average age of the duodenal cases recovering in 1906-1915 was 36 years, of those dying 50 years. The average age of the gastric cases recovering was 32 years, of those dying 51 years. The influence of age on mortality is more clearly shown by decades:

Gastric Cases.

60 to 67,	3 cases	100.0 per cent. died
50 to 59,	4 cases	100.0 per cent. died
40 to 49,	4 cases	25.0 per cent. died
30 to 39,	3 cases	.....
19 to 29,	9 cases	22.2 per cent. died
	23 cases	43.5 per cent. died

Duodenal Cases.

60 to 67,	3 cases	100.0 per cent. died
50 to 59,	6 cases	33.3 per cent. died
40 to 49,	10 cases	30.0 per cent. died
30 to 39,	12 cases	16.6 per cent. died
21 to 29,	10 cases	.....
	41 cases	24.4 per cent. died

The conclusion seems clear therefore that age is an extremely important factor in prognosis. The increase of mortality with age should be borne in mind in connection with operative procedures.

The principal cause of death was peritonitis. Of 32 deaths, 17 occurred within three days, due presumably chiefly to this cause; 6 of these 17 cases, all gastric, died within 18 hours, while the shortest survival in the duodenal cases was 24 hours. I should take this as further evidence that gastric perforation is a more desperate condition than duodenal. Peritonitis as a principal cause was confirmed by autopsy in 5 instances. One case showed also lobar pneumonia, a second, dying on the third day, subdiaphragmatic abscess, and a third, clinically dying from diabetic coma, a chronic pancreatitis.

Three additional deaths occurred in the first week, and 4 during the second. Autopsy in 3 cases showed peri-

tonitis, peritonitis, and focal pneumonia, and in a case dying on the tenth day, subdiaphragmatic abscess with perforation of the diaphragm, right empyema and extension into the lower lobe of the right lung with abscess formation.

Of 8 cases dying after the second week, 6 developed subdiaphragmatic abscess, as shown once by operation, and in the remaining cases by autopsy. Death occurred on the sixteenth, thirty-third, thirty-eighth, fortieth, forty-fourth and fifty-fourth days. Two cases were drained by operation, one case apparently recovering from the abscess after multiple operations when obstruction developed. In a third case a resulting empyema was drained, but an undrained subdiaphragmatic abscess was found at autopsy. In these 6 cases there was an accompanying empyema in 3 cases and an abscess of the lung in 1, in 2 instances due to direct perforation of the diaphragm. Of the total 8 cases of subdiaphragmatic abscess, 6 followed duodenal and 2 gastric perforation.

The remaining 2 cases died on the fifteenth day, one of suppurative nephritis and the other of perforation of the descending colon with peritonitis.

It seems to me that the occurrence of subdiaphragmatic abscess is a matter of particular importance. It developed eight times in 32 cases, or in 25 per cent. of the deaths. It was only recognized clinically and operated on in 2 cases, both of which ultimately resulted fatally. Extension of the process through the diaphragm occurred 5 times, in 3 cases by direct perforation. These facts emphasize the importance of careful study by clinical examination and *x*-ray in cases of unexplained temperature, and the necessity for exploration on the suspicion of abscess.

Of the 82 cases with diffuse peritonitis, 70 were treated by closure or drainage of the perforation alone and 12 had a posterior gastro-enterostomy added. Of these 12

cases, 4 gastric and 8 duodenal, 2 died, 1 from diabetic coma and 1 with delerium tremens. This would appear to give a lesser mortality to those cases in which gastro-enterostomy was done, but it should be noted that these cases were favorable ones at the time of operation.

The cases treated by drainage or packing without suture showed a higher mortality than those closed by suture. Of course, this was largely due to the employment of this measure in the particularly bad conditions in which speed was important, or in perforations difficult of access, or having much surrounding induration. However, the difference is so great that I feel that even in such cases a greater expenditure of time and more manipulation is justifiable to secure good closure. The use of an omental flap sutured over the perforation may be important in this connection.

General irrigation with salt solution was employed in the majority of the earlier cases; its use in the latter cases was much less frequent. The impression given by this series is that the expenditure of time and increase of shock its use requires hardly justifies it as a routine measure. In this connection, culture of the peritoneal fluid obtained at operation is of interest. In 35 cases culture gave a growth seven times and no growth twenty-eight times.

Drainage of the neighborhood of the perforation was almost universally employed. Judging from the results of the culture of the peritoneal fluid, drainage might have been omitted in a larger proportion of cases. However, as it is difficult to tell at operation just in which cases it may be helpful, its use in so many cases, even if occasionally unnecessary, would at least seem justifiable. A tube to the bottom of the pelvis through a suprapubic stab wound was used in a small proportion of cases. It is hard to estimate the effect of this measure. At any rate it would only seem advisable in the case of a considerable collection of definitely purulent fluid in the pelvis.

The great question is, of course, whether gastro-enterostomy is advisable as a general procedure. This will be taken up particularly in discussing the late results. As far as the immediate recovery from perforation is concerned, it is not obvious how a further employment of gastro-enterostomy would have benefited the mortality. The cases did not die from inability of the stomach to pass food into the intestines. They died of shock and sepsis. In looking over the records it is difficult to see that the obstruction caused by infolding through suture of the ulcer excited any bad influence on the mortality. It may be argued that gastro-enterostomy relieves tension on the sutured perforation, and so both lessens the danger of leakage and promotes healing. But if the perforation is reasonably well closed the leakage does not seem likely to occur. It seems to me that the question of gastro-enterostomy at the time of closure of the perforation is a question of its effect on the remote results of the operation to the patient, but not of aiding the immediate likelihood of recovery from perforation.

The question is, Are the late results following the closure alone of perforated ulcers sufficiently good to make the additional time needed for a posterior gastro-enterostomy an unnecessary risk? An attempt has been made to find out the late condition of the patients with special reference to this point. The cases recovering from subacute perforations have been included since the effect of perforation and closure on the gastric and duodenal wall should be approximately the same in either case.

Of the total cases surviving, 57 in number, 12 cases have no bearing on this question, since a gastro-enterostomy was performed at the time of the primary operation. Of these 12 cases, 5 gastric and 7 duodenal, 8 cases have been heard from at periods of from one to eight years; 2 gastric cases were both well; 4 duodenal cases were well; 1 duodenal case when last heard from had recurrent hemorrhage begin-

ning five years after operation, and 1 had died after nineteen months apparently from urinary sepsis following stricture.

Of the remaining 17 gastric cases which recovered following closure or drainage without gastro-enterostomy, 12, or 70 per cent., have been heard from. Two cases have required a secondary gastro-enterostomy, 1 at the end of two months, the other at the end of two and a half years. The first case required a third operation after six years, freeing of gastric adhesions. Both cases were well when heard from one year following the last operation. Two cases had definite gastric symptoms. One of these was strongly alcoholic and died four years following operation. Six cases were free from gastric symptoms. One of these developed phthisis at the end of four years, dying eight years after operation. A second after freedom from gastric symptoms for eleven years developed an obstructive carcinoma of the œsophagus, for which gastrostomy was done. Two cases at the end of three years were in fair health, but required limitations of diet. Thus, to sum up, 6 cases, or one-half, were apparently as completely relieved as they would have been with an additional gastro-enterostomy, 2 cases, while not completely relieved, had tolerable symptoms, while in 4 cases, 2 of which required further operation, the later results were definitely bad.

Of 27 surviving duodenal perforations treated without gastro-enterostomy, 20, or 74 per cent., have been heard from. One of these cases had a second perforation three months following the first, at a point one-half inch distal to the original perforation on the superior aspect of the first part of the duodenum. A gastro-enterostomy was done as well as closure, and the patient reported well two years later. Four other cases had a subsequent gastro-enterostomy. One of these was done one month after closure by advice as a preventive measure, although the patient had no definite digestive symptoms. One case was free from

disturbance for ten years, when he developed moderate digestive symptoms, for which appendectomy and the radical cure of right inguinal hernia was done. Of the remaining 14 cases, 11 reported themselves well at periods of one to twelve years. Two cases had slight symptoms at the end of one year, and one case developed moderate symptoms at the end of five years of freedom.

To sum up, in these 20 cases, there was 1 reperforation, 4 cases had a secondary gastro-enterostomy, 2 cases had moderate, and 2 cases slight digestive symptoms, while 11 cases were apparently relieved following closure of the perforation. The results were apparently good in 11, or 55 per cent., of the cases when heard from, and tolerable in 13, or 65 per cent., of the cases.

In both duodenal and gastric cases it is plain that a primary gastro-enterostomy might have avoided a considerable number of secondary operations. At the same time, about one-half of the cases followed reported themselves well and free from symptoms. It is possible, of course, that symptoms may develop later in these cases. At the same time, as long as freedom from trouble persist for a considerable period in so many cases, it is well to be conservative in adding a method of treatment which prolongs considerably the time of the primary operation. It is not fair, either, to consider that an additional gastro-enterostomy would give 100 per cent. of cures. There is no question but that gastro-enterostomy may be safely added at the primary operation in young people operated on shortly after perforation. Whether or not the added gastro-enterostomy will unfavorably influence the operative mortality will depend on the surgeon's judgment in selecting cases and his speed and skill in carrying it out.

The present series of cases suggests the following contra-indications to gastro-enterostomy. It should not be performed in ulcers definitely gastric. The mortality of closure alone is too high. In addition, closure of such

ulcers is less likely to cause pyloric obstruction, and the benefit of gastro-enterostomy is likely to be less marked than in ulcers of the duodenum.

In perforated duodenal ulcer in cases beyond middle age, gastro-enterostomy should be rarely added, since the mortality of closure of the perforation alone is high in cases at this time of life.

For the remaining duodenal cases it is a matter of individual judgment. If there is the least question as to the patient's power of resistance to the peritoneal infection it should be omitted, since he has at least an even chance of future freedom from symptoms without it. At the worst it may be done as a secondary measure. It is true that many people prefer to get along with discomforts rather than go to the time, trouble, and expense of a second operation, and much might be saved in these cases. At the same time the main aim should be reduction of the primary mortality, and other considerations should remain entirely secondary to this.

Conclusions. 1. This series gives no evidence that pyloric obstruction is a factor increasing the primary mortality which might be avoided by an immediate gastro-enterostomy.

2. Gastric perforations carry a distinctly higher mortality than duodenal.

3. The mortality of both gastric and duodenal perforations is high after middle life.

4. One-half the cases of perforation treated by suture alone were apparently cured following operation.

5. Therefore, an additional gastro-enterostomy may well be avoided in cases of gastric perforation in patients beyond middle life and in any case in which the general condition or elapse of time since perforation suggests possible death from peritonitis.

6. This series suggests that, for the average surgeon, at least, the rule should be to close the perforation and the exception to add a gastro-enterostomy.

A FURTHER REPORT OF EIGHT CASES OF SYPHILIS OF THE STOMACH

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In March, 1915, in a paper [1] read before the New York Surgical Society, I reported 8 cases of syphilis of the stomach.

This report included roentgenological findings made by Le Wald. The patients had been under our care from six to eighteen months, and we felt that the clinical and laboratory data given was sufficient to establish the diagnosis in each instance. However, the general opinion was expressed that a late report upon their condition would be desirable before accepting the diagnosis as final. As all of these patients have now been followed from two to three and one-half years, I trust that further observation of their progress may be of some interest to the members of this Association.

Before taking up the case histories it may not be amiss to review briefly the more important clinical manifestations of the disease. As to the frequency of the condition, Smithies [2] has recently reported 26 cases occurring in the examination of 7545 patients suffering from all types of dyspepsia (0.3 per cent.). In 1603 of these patients there was apparently pathological changes in the stomach and duodenum, of this number 1.6 per cent. were luetic. Of this same group 15.3 per cent. had gastric cancer; 18.7

per cent. gastric ulcer and 39 per cent. duodenal ulcer. While we are unable to give at this time accurate statistics from the stomach cases occurring at St. Luke's Hospital, where the 8 patients comprising this report were observed, I believe that the percentage of syphilitic patients, with definite evidence of stomach disease, will run even higher than that given by Smithies.

Syphilis of the stomach may be congenital or acquired. Two of the cases here reported were undoubtedly of congenital origin—1 in a female, aged fourteen years, the other in a male, aged seventeen years. A history of stomach trouble extending back many years was obtained in both instances. In the 6 cases of the acquired type two gave definite histories of chancre, while in the remaining four there was no history of primary infection. In this group there were 3 males and 3 females; the youngest was aged twenty-two years, the oldest sixty-three years.

The lesions vary from a diffuse syphilitic gastritis, with round-cell infiltration spreading through the submucous tissue, to localized or general gummatous infiltration involving all the coats. These gummatous deposits may be single or multiple and not infrequently ulcerate. One portion of the stomach wall may remain infiltrated while another passes onto ulceration or in the healing stage becomes cicatricial. The irritation of the peritoneal coat results in perigastric adhesions of varying extent. Definite pyloric obstruction may occur as a result of the gummatous infiltration, cicatrization of the ulcer, or from the perigastric adhesions. It is for the relief of this complication that surgery plays an important rôle in the treatment of the disease. Besides the lesions in the stomach wall other evidences of lues are usually found, such as changes in the liver capsule, gummata of the liver, extensive involvement of the gastrohepatic and gastrocolic lymph glands, as well as other evidence of a generalized syphilis.

The symptoms of gastric syphilis, taken as a whole, vary but little from those of other stomach lesions of similar extent, however, upon careful analysis several striking differences become apparent. The pain which is a most constant symptom, lacks the periodicity of that occurring in the average simple ulcer, and it is not so much influenced by the taking of food. It is frequently worse at night and is often referred to as gnawing in character. Vomiting is a persistent and annoying symptom. It was present in all of our cases. Hemorrhage is not so frequent as in peptic or duodenal ulcer which is rather remarkable when the duration and extent of the lesion are taken into consideration. A striking feature of the disease clinically is the rapid, and not infrequently, extreme loss of weight. Gastric analysis was made in 6 of our cases, with the following results. In cases 1, 7 and 8 free hydrochloric acid absent, combined acidity 32, 16 and 14 respectively—in these cases the lesion was extensive, involving a large portion of the stomach wall. In cases 2 and 3, in which the lesion was confined to the pylorus, free hydrochloric acid was 30 and 36, with a total acidity of 52 and 70. In case 4, in which there was hour-glass constriction, the analysis showed free hydrochloric acid 13, total acidity 34. Lactic acid was absent in each case. Guaiac test for blood positive in 5 cases, and the findings would seem to suggest that there is absence of free hydrochloric acid and a low total acidity in the cases, with extensive involvement of the gastric mucosa.

The diagnosis of this condition can be established with a fair degree of certainty if the clinical and laboratory findings are given proper consideration. In the congenital cases the family and previous history of the patient, his general development and appearance, with the symptoms of chronic stomach trouble, should arouse suspicion. The acquired cases may be more difficult to diagnose, but the

past history plus unusual symptoms should suggest that the case is out of the ordinary. In both types of cases the course of the disease differs from the simple gastric or duodenal ulcer, in that it is influenced but little by dieting and the ordinary methods of treatment, and it is unlike malignancy in that there is not the steady and continuous progress to a fatal termination. A positive Wassermann reaction with roentgenological findings, of persistent and unusual deformity of the stomach, establish the diagnosis beyond much doubt. In view of the accuracy of modern laboratory aids to diagnosis one hesitates to refer to the so-called therapeutic test, but the value of antisyphilitic treatment in confirming the diagnosis of syphilis in general cannot be ignored. Such treatment may be of temporary benefit in ordinary ulcer or even cancer of the stomach, but the improvement is of short duration, whereas in the luetic cases there is almost immediate and continued relief from symptoms.

Owing to the close resemblance between syphilitic infiltration and tuberculosis, and the difficulty of staining for Spirochetæ pallidæ, the pathological diagnosis of syphilis of the stomach is extremely difficult to establish. Specimens were removed for examination in 2 of our cases, but a positive diagnosis from this tissue could not be made—both were negative for tubercle bacilli as well as for Spirochetæ pallidæ.

Vigorous antiluetic treatment should be instituted as soon as the clinical diagnosis is established. If the lesion has not progressed to the cicatricial stage, causing obstruction at the pylorus or hour-glass contraction has not taken place from cicatrization in the body of the stomach or from perigastric adhesions, the symptoms will be controlled almost immediately. On the other hand, should symptoms of obstruction be present either from gummatous infiltration or cicatrization, operative intervention may

become necessary—in fact, demanded. Gastro-enterostomy is the operation of choice if the condition of the stomach wall will permit; if not, jejunostomy is indicated to be followed later by whatever operative procedure necessary to restore the stomach to a functionating condition. Efficient antiluetic treatment may so improve the lesion that further operative interference may not be called for. As stated in our previous paper, we are aware of the fact that all gastric ulcers, syphilitic or otherwise, have potential dangers, and for this reason the advisability of excision or resection should be considered in every suitable case. It is my personal belief, however, that since syphilis of the stomach is only the local evidence of a general disease, no case should be subjected to more than the simplest form of operation, necessary to relieve urgent symptoms, until after antiluetic treatment has been given a trial. The after-history of the cases forming this report support this belief.

Present Status of Cases. In 5 of the cases gastro-enterostomy was performed in order to relieve symptoms of obstruction. In the remaining 3, even though vomiting was present, roentgen examination demonstrated bismuth passing freely through the pylorus, and for this reason immediate operation was not indicated. Under appropriate treatment relief from symptoms in each case was rapid, and up to the present time these patients have made just as satisfactory progress as those subjected to operation. We have recently learned that Case No. 4 died in August, 1916, of Bright's disease. This patient had been observed in the hospital in February, 1916, one year after the diagnosis of syphilis of the stomach had been made, suffering from syphilitic aortitis and myocarditis. Her Wassermann remained four plus, and the chances are that death resulted from a generalized syphilis. She had held her gain in weight, and the gastro-enterostomy plus treat-

ment apparently had relieved the gastric symptoms. The remaining 7 cases are well from a clinical stand-point, insofar as their stomachs are concerned, and are able to follow their usual vocations. Pain and vomiting have disappeared, there has been a gain in weight of from ten to over fifty pounds, and their entire appearance has changed for the better. The most striking improvement has taken place in the 2 congenital cases—from stunted undersized children they have developed and filled out to normal proportions. While treatment with salvarsan, mercury, and the iodides has been carried out systematically in all the cases, in only 1 of 6, in which recent tests have been made, has the Wassermann reaction proved negative. Case No. 2 returned in October of this year complaining of distress after meals. Examination disclosed a large prostate gland with urinary retention. Removal of the prostate seems to have relieved the symptoms referable to his stomach, and he has now returned to work.

We cannot expect these patients to remain permanently free of stomach symptoms, even though "clinically cured" at this time, for, as is well recognized, there is the tendency for every case of syphilis to relapse, however well treated. I shall therefore follow the future history of these patients with unusual interest. Whether or not we have been justified in assuming the diagnosis in this series of cases to be correct the fact remains that the symptoms have been controlled and the patients "clinically cured" for periods extending from one and one-half to three and one-half years.

A complete history of the cases was included in the paper already referred to, and for that reason I shall review only such parts of the histories as are necessary to give a clear idea of the condition of the patients at the time they came under our observation.

FIG. 1

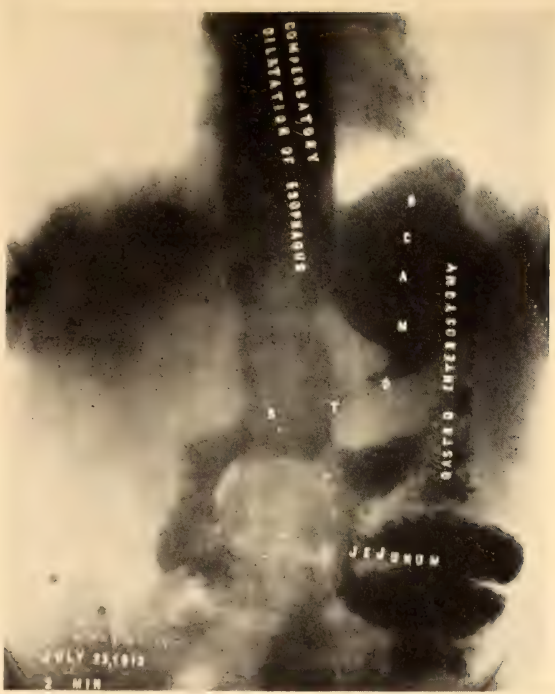

FIG. 2

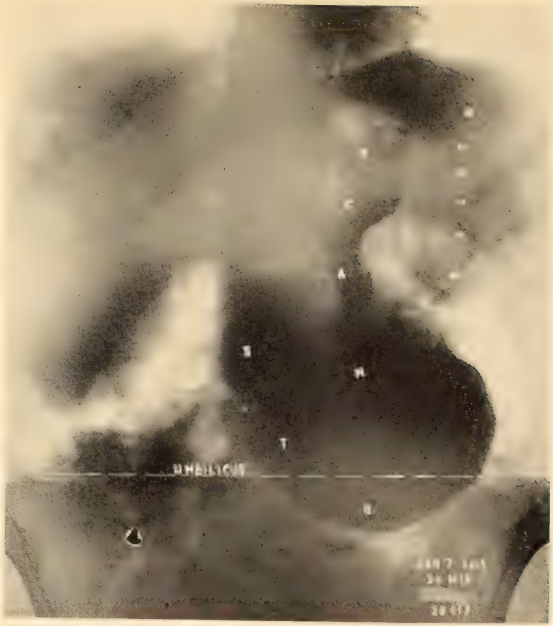

FIG. 1.—Case 1, girl, aged fourteen years. Note dumb-bell-like appearance due to sclerosis of body of stomach. After gastro-enterostomy most of food goes through opening, but enough passes through stenosed portion to outline it. Note compensatory dilatation of esophagus.

FIG. 2.—Case 4, woman, aged thirty-four years. Not hour-glass constriction with long channel between pouches. Condition confirmed at operation and relieved by breaking up of perigastric adhesions and performance of gastro-enterostomy to the lower pouch.

Fig. 3

Fig. 4

Fig. 3.—Case 5, woman, aged twenty-three years. Note deformity at pyloric third of stomach due to sclerosis. Note close resemblance to new growth. Diagnosis of syphilis confirmed by operation and microscopic examination of section of stomach wall. Symptoms relieved by gastro-enterostomy, but deformity persisted.

Fig. 4.—Case 6, boy, aged seventeen years. Note deformity at junction of pyloric and middle thirds of stomach. This case responded to medical treatment, but the deformity remained.

FIG. 5

FIG. 6

FIG. 5.—Case 7, man, aged sixty-two years. Note deformity of body of stomach and pyloric region, due to sclerosis. Note small size of stomach and rapid emptying time; exposure made three minutes after full bismuth meal. Note complete filling of duodenum. This case responded to medical treatment.

FIG. 6.—Case 7, two years and three months after treatment. Capacity of stomach greater, suggesting less infiltration. Stomach empties less rapidly.

Fig. 7

Fig. 8

Fig. 7.—Case 8, woman, aged twenty-three years. Note small size of stomach due to retraction from sclerosis of middle of body and adjoining pyloric region. Very rapid emptying time. Exposure made three minutes after bismuth meal. Note compensatory dilatation of esophagus to make up for small size of stomach. Note complete filling of duodenum. This case responded to medical treatment, but deformity remained.

Fig. 8.—Case 8, two years and a half after treatment. Note improvement in this case—similar to that in Case 7.

Case I.—H. D., female, aged fourteen years. Congenital type. Admitted June 10, 1913. Pain and discomfort in region of stomach as long as she can remember. Persistent vomiting for past six months. Retains only liquid food. Weight, fifty-two pounds. Wassermann four plus positive. Roentgen examination showed dumb-bell-shaped deformity involving the middle and pyloric portions of the stomach, with almost complete obstruction. Gastro-enterostomy July 12, 1913, followed by antiluetic treatment irregularly for two years, but has had systematic treatment during past year; now weighs seventy-seven and one-half pounds; eats well and rarely complains of stomach. Wassermann remains three plus. Recent roentgen examination shows very little bismuth passing through pylorus.

Case II.—T. S., male, aged sixty-three years. Admitted April 6, 1914. Chancre forty years ago. Aching pain in stomach for six months; irregular vomiting; Argyll-Robertson pupils; absent knee-jerks. Weight loss ten pounds. Roentgen examination showed deformity at pylorus, with large six-hour residue. Wassermann four plus positive. Put on antisyphilitic treatment. Returned to hospital June 19, 1914, having gained some weight, but with continuation of obstructive symptoms. June 27, 1914, gastro-enterostomy. Resumed work in a few weeks. Treatment constant since operation. Has recently had some discomfort in stomach. Returned to hospital October, 1916, for the removal of large prostate. Discharged in four weeks and is now back at work. Wassermann negative. Recent *x*-ray examination shows very little if any change at the pylorus, with moderate six hour residue.

Case III.—D. D., male, aged forty-two years. Admitted October 21, 1914. Pain of gnawing character in epigastric region for five years; irregular vomiting up to eight weeks ago, constant since that time. Lost twenty

pounds in weight. Denies primary sore; marked arteriosclerosis. Wassermann four plus positive. Weight 115 pounds. Roentgen examination shows great dilatation of stomach due to obstruction at pylorus, with large six-hour residue. Salvarsan and mixed treatment for ten days, but without sufficient improvement to warrant longer delay in advising operation. November 3, 1914, gastro-enterostomy. Has continued treatment. Gained over forty pounds. Free from all symptoms. Roentgen examination (September, 1916,) shows no change at pylorus, and gastro-enterostomy works satisfactorily. Wassermann four plus.

Case IV.—G. R., widow, aged thirty-four years. Admitted January 4, 1915. No history of primary infection. Pain in region of stomach and gall-bladder for ten years. One attack of jaundice. Vomited at intervals, usually shortly after taking food. For years had noticed swelling in right upper abdomen; recently tenderness had developed in this region. Wassermann four plus positive. Weight 116 pounds. Roentgen examination revealed an hour-glass deformity of the stomach, with retention of bismuth in the distal pouch for twenty-four hours. January 13, 1915, cholecystectomy for hydrops. Gastro-enterostomy. The hour-glass constriction was caused chiefly by adhesions to the parietal peritoneum and the liver. Convalescence straight forward. Treatment followed intermittently. One year after operation returned to hospital, with syphilitic aortitis, myocarditis, and nephritis. Discharged improved in three or four weeks. Practically no stomach trouble since operation, and has gained over twenty pounds. Wassermann four plus. *X*-ray shows gastroenterostomy working rather slowly. This patient moved to a distant city, and we have just learned that she died in August, 1916, of Bright's disease.

Case V.—F. G., female, aged twenty-three years. Admitted January 15, 1915. Married three years. No

history of infection. Husband gives four plus Wassermann. Child one year old also gives positive Wassermann. For past eight months pain in stomach, coming on shortly after eating; pain relieved by vomiting. Constant vomiting for two months. Palpation shows firm indefinite mass in epigastrium. Weight eighty-eight pounds. Roentgen examination shows filling defect in pyloric third of stomach, with retention of bismuth after twenty-four hours. Gastro-enterostomy January 27, 1915. Rapid recovery. Put upon antisyphilitic treatment, which has been continued to present time. Is free from stomach symptoms. *X*-ray shows gastro-enterostomy working satisfactorily, but deformity in pyloric region still persists. Wassermann remains positive.

Case VI.—W. H., male, aged seventeen years. Admitted October 30, 1913. Congenital type. For five years discomfort in region of stomach. Acute attacks of intermittent pain recently. Vomits at intervals. Lives almost entirely on fluids. Weight sixty-eight pounds; height 5 feet 1½ inches. Wassermann four plus. Referred to us for appendectomy, with the idea that the stomach symptoms were possibly reflex. Roentgen examination showed peculiar deformity of stomach, suggesting syphilitic infiltration. Bismuth passed out fairly rapidly, and it was decided to push antisyphilitic treatment, with the result that there was marked improvement. He has continued to gain to present time. Weighs 116 pounds, eats all sorts of food and feels well. Roentgen examination December 3, 1916, shows deformity still exists, but stomach empties in six hours.

Case VII.—D. F., male, aged sixty-two years. Admitted August, 1914. Primary infection many years ago. Eighteen months ago began to have sharp, cutting pains in stomach—worse at night; no relation to meals. For six months only been able to take liquids. Weighs ninety-

seven pounds. Wassermann four plus positive. Roentgen examination showed deformity involving the pyloric half of the stomach, with peculiar narrowing of the calibre of this portion. Stomach emptied at a very rapid rate, indicating that the pylorus was held open by infiltration of the stomach wall. Started on antisyphilitic treatment. There was rapid improvement in all symptoms. Soon returned to work as traveling salesman. September, 1916, weighs 137 pounds and is free from stomach symptoms. Roentgen examination shows deformity only slightly changed. Wassermann remains four plus.

Case VIII.—M. A., female, aged twenty-three years. Admitted September, 1914. Married two years. No history of primary infection. For about one year has suffered almost constantly from attacks of intense pain in stomach—usually relieved by vomiting. Weighs seventy-five pounds—reduction of about one-half former weight. Wassermann four plus—Wassermann on husband negative. Roentgen examination showed deformity of pyloric half of stomach. This region apparently infiltrated together, with pyloric ring, which was held open. This finding was corroborated one week later. October 8, 1914, antiluetic treatment begun, and at the time of discharge from hospital (December 13, 1914,) had gained thirty pounds in weight. All symptoms relieved. Roentgen examination, February, 1916, showed some improvement in deformity, with stomach emptying at normal rate. November 20, 1916, unable to report for examination, as she has just been confined. Is free from all symptoms and has gained fifty-four pounds in weight.

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CHRONIC GASTRIC AND DUODENAL ULCER[1]

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A study of the literature on chronic gastric and duodenal ulcer leads us to conclude:

1. The primary cause of peptic ulcer is probably an infection, carried from a septic focus in some other part of the body by way of the blood stream to the stomach, where it effects a lodgment, and so devitalizes the tissues that they fall a prey to the digestive action of the gastric juice. An ulcer is the result. Enough of the organisms seem to remain in the wall of the ulcer, in many instances, to keep the vitality of the tissues permanently lowered. The irritation seems to create a spasmodic action of the pylorus, which at the same time, shuts up the acid in the stomach for an abnormally long time, thus increasing its corrosive action.

2. While realizing that peptic ulcer is not altogether a surgical condition, it is quite certain that 50 per cent. or more of true chronic gastric and duodenal ulcers may be better and more safely treated by surgery than by medical means. The mortality of gastric and duodenal ulcers by medical treatment can apparently not be determined with any degree of accuracy. The mortality, as the direct result of surgical treatment, ranges all the way from 2 per cent. to 12 per cent. or more, depending upon the skill of the surgeon, for there is probably no place in surgery in which the skill, experience, and judgment of the surgeon count for more than in the surgical treatment of chronic gastric and duodenal ulcer.

Concerning the ultimate results in those patients who recover from the operation, statistics show that 60 to 75 per cent. are absolutely cured; from 75 to 90 per cent. are

[1] See Internat. Abst. Surg., March, 1917, p. 217.

either absolutely cured, or are so greatly benefited that they do not require further medical treatment.

Obviously, it is impossible to compare the ultimate results of medical treatment with surgical treatment, for every conservative surgeon insists that every case of peptic ulcer shall have the advantage of good medical treatment before surgery is considered. Therefore, every well-selected surgical case of gastric or duodenal ulcer represents a medical failure, or more accurately stated, repeated failures on the same patient. So, if the medical man can cure 50 per cent. of the cases of ulcer, and we as surgeons can cure 85 per cent. of his failures, there seems to be no good reason for rivalry.

3. Concerning the *modus operandi* of the cure of gastric and duodenal ulcer, most recent authorities seem to agree that the chief end to be desired is rest and the reduction of the acidity of the gastric juice. The most modern and apparently the most rational, medical treatment (Sippy's), is based entirely upon temporarily neutralizing the acid gastric juice by the frequent administration of bland foods and alkalies, combined with the removal of the excessive gastric juice during the hours when food is not taken, thereby permitting the ulcer to heal. A certain percentage of ulcers thus treated medically apparently recur, and repeatedly recur in a few weeks or months after the treatment has been discontinued. It is this class of cases that the surgeon is called upon to treat. His work is to neutralize the acidity of the gastric juice by a continuous and permanent automatic process.

There are two theories as to the way in which this reduction (30 per cent. according to Paterson) of the acidity of the stomach contents is brought about: (*a*) more rapid drainage, by which the acid is drawn out of the stomach; (*b*) a new opening which increases the flow of alkaline bile and pancreatic juice into the stomach.

There is a good deal of rivalry between the advocates of these two theories. Both in the interests of harmony, and because it is probably true, it seems wise to suggest that both theories are right, and that the reduction is brought about

both by permitting a more rapid exit of the acid gastric juice and at the same time a more extensive inflow of alkaline bile and pancreatic juice.

4. The more radical operations, such as excision of ulcer, segmental excision of portions of the stomach for ulcer, blocking of the pyloric end of the stomach by various methods, have certainly given us a greater mortality than occurs with simple gastro-enterostomy. There is no adequate proof in the sum total of the literature on the subject to indicate that the results are enough better to justify the increased danger. It is undoubtedly true that the great majority of conservative surgeons are returning to the belief that posterior gastro-enterostomy is the operation of choice, and may possibly be the only operation which should be used in the treatment of gastric and duodenal ulcer, except for very special indications.

5. The fifth conclusion we shall put in the form of a question, and shall attempt to answer the question by a study of statistics: Is the operation of gastro-enterostomy so safe, and are the after-results of the operation so sure, that the average surgeon, and more particularly the occasional operator, can conscientiously urge his patient to be operated upon for gastric or duodenal ulcer? What are the facts concerning the mortality and ultimate results of the surgical treatment of gastric and duodenal ulcer?

Unfortunately, accurate facts are quite hard to obtain in the literature. The general impression has gone abroad that an operation is quite certainly a cure for peptic ulcer, and that the mortality is very low. As a result of this, general surgeons, who have had no special training in and have made no special study of the subject, do not hesitate to recommend and perform surgical operations for ulcer of the stomach and duodenum whenever such cases present themselves for treatment. Furthermore, everywhere in the country general practitioners, doing only the surgery coming in their family practice, are doing surgery for ulcer of the stomach and duodenum.

Outside of the Mayo Clinic, which during the past few years has reported the smallest death rate in a large series of cases that has been reported, Finney seems to have obtained the best results in a series of consecutive cases, extending over a period of ten years or more, that have been reported.

I think it will be conceded that no surgeon in Continental Europe ranks higher in gastric surgery that von Eiselsberg of Vienna.

From the stand-point of the number of cases of gastric and duodenal ulcer operated upon, and the good results obtained from the operation, the reports of the Massachusetts General Hospital show better than any other hospital in America, except the Mayo Clinic, as far as the reports have come to me.

I think that no competent judge of hospitals could name the twelve best conducted hospitals (speaking from the stand-point of medical and surgical efficiency) without including the Roosevelt Hospital in New York City. Dr. Charles H. Peck, one of the most reliable surgeons in America, has recently reported the work in gastric and duodenal ulcer by the staff of Roosevelt Hospital from January 1, 1910, to June, 1915 (five and a half years).

As we have accurate reports from these four sources, I beg to submit the results of the very best work that is done anywhere as shown in Tables I and II.

Now, if the best hospitals, and among the very best surgeons of the world, in the aggregate, have a mortality of 7.5 per cent. in the surgical treatment of gastric and duodenal ulcer, and a mortality of 6.1 per cent. following gastro-enterostomy for ulcer, what are we to expect as to the actual mortality in the hands of the staffs of the average, and below the average, hospital? It certainly would be much greater than the statistics I have just quoted. And above all, what are the probable statistics in the hands of the occasional operator? It is safe to hazard the guess that most of us would prefer to keep our ulcers rather than to take the chance.

Operations for Chronic Gastric and Duodenal Ulcers

TABLE I—SURGEONS

	No. cases.	Deaths.	Per cent.	Secondary peptic ulcer.
Finney—1902 to 1915 (13 years)				
Pyloroplasty (Finney)	100	5	5	2
Simple gastro-enterostomy	100	7	7	0
Total	200	12	6	2
Von Eiselsberg—1904 to 1914 (10 years)				
Simple gastro-enterostomy	334	17	5	4
Gastro-enterostomy with unilateral exclusion	36	0	0	3
Excision of ulcer	56	9	16	
Jejunostomy	24	12	50	
Pylorectomy 41 cases (mortality not stated)				
Total	450	38	8.3	7

TABLE II—HOSPITALS

	No. cases.	Deaths.	Per cen t
Massachusetts General Hospital			
1911	22	0	
1912	43	2	
1913	54	7	
1914	48	1	
Total	167	10	6
Gastro-enterostomies	150	9	6
Staff of Roosevelt Hospital (Reported by Charles H. Peck)			
January, 1910, to June, 1915, five and a half years)			
Total	104	10	9.6
Gastro-enterostomies	87	8	9.2

Total number of cases of chronic gastric and duodenal ulcer operated upon and included in the above reports of von Eiselsberg, Finney, Massachusetts General Hospital and Roosevelt Hospital, 931; deaths 70 (7.5 per cent.). Total number of gastro-enterostomies, 671; deaths 41 (6.1 per cent.).

TABLE III—OPERATIONS FOR CHRONIC GASTRIC AND DUODENAL ULCER—AUTHOR'S CASES

No.	Sex.	Date.	Type of operation.	Result of operation.	Later complications.
		1904 (2 cases)			
1	M.	April 14	Posterior gastro-enterostomy	Recovered	
2	M.	August 1	Posterior gastro-enterostomy	Recovered	
		1905 (4 cases)			
3	F.	May 29	Posterior gastro-enterostomy	Recovered	
4	F.	June 4	Posterior gastro-enterostomy	Recovered	
5	F.	July 13	Posterior gastro-enterostomy	Recovered	
6	F.	August 9	Posterior gastro-enterostomy	Recovered	
		1906 (3 cases)			
7	F.	February 18	Posterior gastro-enterostomy	Recovered	
8	M.	April 17	Posterior gastro-enterostomy	Recovered	
9	F.	December 6	Posterior gastro-enterostomy	Recovered	
		1907 (11 cases)			
10	F.	January 18	Posterior gastro-enterostomy	Recovered	
11	M.	January 20	Posterior gastro-enterostomy	Recovered	
12	M.	March 4	Posterior gastro-enterostomy	Recovered	
13	M.	April 6	Posterior gastro-enterostomy	Recovered	
14	M.	May 2	Posterior gastro-enterostomy	Recovered	
15	F.	July 8	Posterior gastro-enterostomy	Recovered	
16	M.	July 10	Finney	Recovered	
17	F.	October 15	Posterior gastro-enterostomy	Recovered	
18	F.	November 8	Posterior gastro-enterostomy	Recovered	Two years later pylorus cut off; no benefit.
19	M.	November 19	Rodman pylorectomy and posterior gastro-enterostomy	Recovered	

20	M.	December 6 1908 (6 cases)	Posterior gastro-enterostomy	Died of uremia	
21	F.	July 24	Posterior gastro-enterostomy	Recovered	
22	M.	July 27	Posterior gastro-enterostomy	Recovered	
23	F.	August 1	Posterior gastro-enterostomy	Recovered	
24	M.	October 11	Posterior gastro-enterostomy	Recovered	
25	F.	October 13	Posterior gastro-enterostomy	Recovered	
26	F.	November 8 1909 (8 cases)	Posterior gastro-enterostomy	Recovered	
27	F.	March 10	Posterior gastro-enterostomy	Recovered	
28	M.	July 22	Posterior gastro-enterostomy	Recovered	
29	F.	July 30	Posterior gastro-enterostomy	Recovered	
30	M.	August 3	Posterior gastro-enterostomy	Recovered	
31	F.	September 13	Posterior gastro-enterostomy	Recovered	
32	F.	September 26	Posterior gastro-enterostomy	Recovered	
33	M.	November 4	Posterior gastro-enterostomy	Recovered	
34	M.	November 12 1910 (14 cases)	Posterior gastro-enterostomy	Recovered	
35	M.	January 6	Posterior gastro-enterostomy	Recovered	
36	F.	April 25	Posterior gastro-enterostomy and gastrogastrostomy for double hour-glass	Recovered	
37	M.	April 26	Posterior gastro-enterostomy	Recovered	
38	M.	May 20	Posterior gastro-enterostomy	Recovered	
39	M.	July 1	Sleeve resection	Recovered	
40	F.	July 1	Excision of ulcer	Recovered	Dilatation later for stricture.
41	M.	July 10	Posterior gastro-enterostomy	Recovered	
42	F.	October 28	Posterior gastro-enterostomy	Recovered	
43	M.	October 28	Posterior gastro-enterostomy	Died of hemorrhage following excessive pressure of clamps	

TABLE III—(*continued*)

No.	Sex.	Date.	Type of operation.	Result of operation.	Later complications.
44	F.	November 18	Excision of ulcer	Recovered	Now has hour-glass stomach with partial obstruction.
45	M.	November 18	Finney	Recovered	
46	M.	November 22	Excision of ulcer	Recovered	
47	M.	December 7	Excision of ulcer	Recovered	Died in 1915 of pulmonary trouble.
48	M.	December 15	Posterior gastro-enterostomy	Recovered	
		1911 (7 cases)			
49	M.	January 5	Posterior gastro-enterostomy	Recovered	
50	F.	April 3	Excision of ulcer	Recovered	Died of carcinoma of stomach in 1915.
51	M.	May 10	Posterior gastro-enterostomy	Recovered	
52	M.	July 27	Finney	Recovered	
53	M.	September 13	Posterior gastro-enterostomy	Recovered	Died of tuberculosis in 1914.
54	M.	November 4	Posterior gastro-enterostomy	Recovered	
55	M.	November 14	Rodman pylorectomy and posterior gastro-enterostomy	Recovered	von Eiselsberg exclusion 1915 by another surgeon.
		1912 (9 cases)			
56	M.	March 12	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	
57	F.	March 23	Excision of ulcer	Recovered	
58	F.	April 10	Posterior gastro-enterostomy	Recovered	
59	M.	April 13	Posterior gastro-enterostomy	Recovered	
60	F.	April 25	Posterior gastro-enterostomy	Recovered	
61	M.	May 28	Excision of ulcer	Recovered	
62	M.	December 9	Sleeve resection	Recovered	
63	F.	December 12	Rodman pylorectomy and posterior gastro-enterostomy	Died; pneumonia	

64	M.	December 21	Rodman pylorectomy and posterior gastro-enterostomy	Recovered	
		1913 (18 cases)			
65	F.	January 13	Excision of ulcer	Recovered	
66	M.	January 23	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	
67	M.	March 11	Posterior gastro-enterostomy	Recovered	
68	M.	March 15	Posterior gastro-enterostomy	Recovered	
69	F.	March 28	Excision of ulcer	Recovered	Ulcer has returned.
70	F.	April 15	Rodman pylorectomy and posterior gastro-enterostomy	Recovered	
71	M.	May 29	von Eiselsberg exclusion and posterior gastro-enterostomy	Died	
72	M.	July 22	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	Secondary gastric ulcer distal to anastomosis excised January 23, 1914; recurrence; excised year later; died as result of third operation.
73	M.	July 31	Posterior gastro-enterostomy	Recovered	
74	F.	August 4	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	Died two years later "with stomach trouble and anemia."
75	F.	August 5	Rodman pylorectomy and posterior gastro-enterostomy	Recovered	
76	M.	August 16	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	
77	F.	September 3	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	

TABLE III—(*continued*)

No.	Sex.	Date.	Type of operation.	Result of operation	Later complications
78	F.	September 20	Rodman pylorectomy and posterior gastro-enterostomy	Recovered	
79	M.	October 16	Rodman pylorectomy and posterior gastro-enterostomy	Recovered	
80	M.	October 16	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	
81	F.	December 29	Rodman pylorectomy and posterior gastro-enterostomy	Recovered	Died of carcinoma of liver one year later.
82	M.	December 30	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	
		1914 (25 cases)			
83	M.	January 5	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	Secondary ulcer in stomach, distal to anastomosis, second operation year later; excision ulcer; anterior gastro-enterostomy; recurrence; third and fourth operations by Dr. Mayo.
84	F.	February 14	Rodman pylorectomy and posterior gastro-enterostomy	Recovered	
85	F.	February 28	Posterior gastro-enterostomy	Recovered	
86	M.	March 5	Posterior gastro-enterostomy	Recovered	
87	F.	April 9	Posterior gastro-enterostomy	Recovered	
88	F.	April 13	Finney with excision of duodenal ulcer	Recovered	
89	F.	April 20	Posterior gastro-enterostomy	Recovered	
90	F.	April 30	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	
91	M.	June 8	Sleeve resection	Recovered	
92	M.	June 10	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	

93	F.	June 15	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered
94	M.	June 16	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered
95	F.	June 29	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered
96	M.	July 16	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered
97	M.	July 20	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered
98	M.	July 30	von Eiselsberg exclusion and posterior gastro-enterostomy	Died
99	M.	August 10	Posterior gastro-enterostomy	Recovered
100	M.	August 11	Posterior gastro-enterostomy	Recovered
101	F.	August 18	Posterior gastro-enterostomy	Recovered
102	F.	August 25	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered
103	F.	August 31	Posterior gastro-enterostomy	Recovered
104	M.	September 7	Posterior gastro-enterostomy	Recovered
105	F.	September 14	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered
106	M.	October 13	Posterior gastro-enterostomy	Recovered
107	M.	December 15	Posterior gastro-enterostomy	Recovered
		1915 (27 cases)		
108	F.	January 6	Sleeve resection	Died
109	M.	January 7	Posterior gastro-enterostomy	Recovered
110	F.	January 8	Posterior gastro-enterostomy	Recovered
111	F.	January 9	Posterior gastro-enterostomy	Recovered
112	M.	January 19	Posterior gastro-enterostomy	Recovered

TABLE III—(*concluded*)

No.	Sex.	Date.	Type of operation.	Result of operation.	Later complications.
113	F.	January 21	Posterior gastro-enterostomy	Recovered	
114	M.	February 5	Posterior gastro-enterostomy	Recovered	
115	F.	February 13	Sleeve resection	Recovered	
116	M.	March 11	Rodman resection and posterior gastro-enterostomy	Recovered	
117	M.	March 12	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	Severe hemorrhage one year later.
118	M.	March 15	Finney, with excision of duodenal ulcer	Recovered	
119	M.	May 26	Posterior gastro-enterostomy	Recovered	
120	M.	July 9	Rodman and posterior gastro-enterostomy	Died twelfth day after operation for relief of obstruction.	
121	M.	July 19	Posterior gastro-enterostomy	Recovered	
122	F.	July 29	Excision of ulcer	Recovered	Not relieved.
123	M.	August 25	Posterior gastro-enterostomy	Recovered	
124	M.	September 8	von Eiselsberg exclusion and posterior gastro-enterostomy	Recovered	
125	M.	September 25	Rodman two-stage	Recovered	
126	M.	October 6	Posterior gastro-enterostomy	Recovered	Severe hemorrhage one year later.
127	M.	October 17	Rodman resection and posterior gastro-enterostomy	Recovered	
128	F.	October 11	Posterior gastro-enterostomy	Recovered	
129	F.	October 30	Finney with excision of duodenal ulcer	Recovered	

130	M.	November 11	Posterior gastro-enterostomy	Recovered	
131	M.	November 30	Finney	Recovered	
132	M.	December 2	Sleeve resection	Recovered	Not cured.
133	F.	December 21	Posterior gastro-enterostomy	Recovered	
134	M.	December 23	Posterior gastro-enterostomy	Recovered	Secondary perforating ulcer with death ten months later from uremia following operation.
		1916 (16 cases	up to November)		
135	F.	January 10	Anterior gastro-enterostomy	Recovered	Not well.
136	F.	February 21	Finney	Recovered	
137	M.	March 7	Finney and Balfour	Died. Uremia	
138	M.	March 15	Posterior gastro-enterostomy	Recovered	
139	F.	April 1	Jejunostomy	Recovered	Died six months later with hemorrhage.
140	M.	April 3	Posterior gastro-enterostomy	Recovered	
141	M.	May 4	Posterior gastro-enterostomy	Recovered	
142	F.	May 15	Posterior gastro-enterostomy	Recovered	Ulcer not relieved; partial gastrectomy, July 18, 1916, recovered.
143	F.	September 11	Sleeve resection	Recovered	
144	F.	September 21	Sleeve resection also posterior gastro-enterostomy	Recovered	Died thirty days later from hemorrhage due to erosion of large vessel in secondary ulcer.
145	F.	September 25	Sleeve resection	Recovered	
146	F.	October 13	Posterior gastro-enterostomy	Recovered	
147	M.	November 18	Posterior gastro-enterostomy	Recovered	
148	M.	November 18	Balfour	Recovered	
149	M.	November 25	Posterior gastro-enterostomy	Recovered	
150	M.	November 28	Posterior gastro-enterostomy	Recovered	

In my own practice I have probably done a larger proportion of radical operations, such as excision of the ulcer, unilateral exclusion, and other forms of pyloric blocking, and pylorectomy, than most operators. Therefore I beg to submit Table III, which includes every case of chronic gastric and duodenal ulcer that has been operated upon by me in my regular operating hospital from April 14, 1904, to November 28, 1916. Cases 1 to 42 were operated upon in the North Pacific Sanatorium (private hospital); Cases 42 to 107 inclusive, were operated upon in St. Vincent's Hospital; Cases 108 to 150, inclusive, were operated upon in the Portland Surgical Hospital (private hospital). A few cases have been operated upon at miscellaneous hospitals, of which we have no accurate record, and which it would not be proper to report, even if we had. The cases are given by years; also, the date upon which the patient entered the hospital is given; the type of operation performed; the immediate result of the operation; and the known later complications.

Table IV gives a summary of the twelve years' work, including 150 cases.

TABLE IV—CASES OPERATED UPON FROM APRIL 14, 1904, TO NOVEMBER 28, 1916 (12 YEARS)

	No. cases.	Died.	Per cent.	Secondary peptic ulcer.
Simple gastro-enterostomy	84	2	2.3	1
Finney pyloroplasty	8	0	0	..
Finney and Balfour (combined)	1	1	100	..
Balfour cautery	1	0	0	..
Rodman pylorectomy—with gastro-enterostomy	14	2	14.3	..
von Eiselsberg exclusion—with gastro-enterostomy	22	2	9.1	2
Simple excision of callous ulcer	10	0	0	..
Sleeve resection	8	1	12.5	1
Jejunostomy	1	0	0	..
Total	150	8	5.3	4

Table V gives a summary of the last six years' work of the twelve, including 107 cases.

TABLE V—CASES OPERATED UPON FROM NOVEMBER 18, 1910, TO NOVEMBER 28, 1916 (6 YEARS)

	No. cases.	Died.	Per cent.	Secondary peptic ulcer.
Simple gastro-enterostomy	45	0	0	1
Finney pyloroplasty	7	0	0	..
Balfour cautery	1	0	0	..
Simple excision of callous ulcer	9	0	0	..
Jejunostomy	1	0	0	..
Sleeve resection	7	1	14.3	1
Finney and Balfour (combined)	1	1	100	..
von Eiselsberg exclusion—with gastro-enterostomy	22	2	9.1	2
Rodman pylorectomy—with gastro-enterostomy	13	2	15.4	..
Total	107	6	5.6	4

In one sense I am proud of this report. In another I am sad to think that had I been less radical several of my patients who died would have been alive. For I must confess that the 4 patients operated upon by the von Eiselsberg and Rodman methods, who died, were no more difficult and no worse operative risks than the 83 patients upon whom I did a simple gastro-enterostomy without exclusion or resection. Assuming this to be the fact, there would have been one fatality in these cases instead of four. Also, had the 22 patients operated upon by the von Eiselsberg exclusion and gastro-enterostomy been operated upon by simple gastro-enterostomy, the probabilities are that there would have been no secondary ulcer in either case.

The optimist may say that this is luck, were it not for the fact that all of these patients on whom resection or exclusion was done had a more stormy convalescence than those upon whom a simple gastro-enterostomy was done.

The optimist might further state that possibly the ultimate results might be enough better to compensate for the increased mortality. Unfortunately this has not been the

case, for a general survey of the simple gastro-enterostomy cases compared with the von Eiselsberg exclusion cases shows nothing in favor of the von Eiselsberg operation in the ultimate results.

The optimist might further state that the fact of two secondary ulcers having developed after this operation might be purely accidental; but why did 3 out of 36 of von Eiselsberg's patients on which the unilateral exclusion had been performed (a rate of $8\frac{1}{3}$ per cent.) develop secondary ulcer, while only a little more than 1 per cent. of his simple gastro-enterostomies developed secondary ulcer?

If there were advantages in the exclusion operation or the resection operation, such an operation should be done in two stages: The gastro-enterostomy first, and in the course of two to four weeks, the exclusion or resection operation, if necessary. As a rule, however, the patient is so well at this length of time that there seems no need for the second operation. In at least 5 out of the 6 such operations which I have done in two stages, the ulcer had disappeared to such an extent that it seemed a shame to do any further operating, and in one I actually closed up without doing the second operation.

As a result of a careful study of this subject, together with a limited personal experience, I believe the following will be my practice in the future:

All duodenal ulcers will be covered over by omentum, and a posterior gastro-enterostomy by the Mayo or Moynihan technic performed, without artificial obstruction. Or, in certain cases, it is convenient to excise an ulcer near the pylorus combined with a Finney pyloroplasty.

Gastric ulcers on the lesser curvature, which are small and indurated, will be treated by the Balfour cautery plus the Finney pyloroplasty, or gastro-enterostomy.

Large ulcers in other parts of the stomach will be treated by first doing a gastro-enterostomy, or a Finney pyloroplasty, followed by Sippy's plan of medical treatment, with a resection later, if necessary.

Ulcers involving a very large area of the wall of the stomach may be given rest and the patient nourished by jejunostomy.

Ulcers near the pylorus, having a suspicion of cancer, will be treated by the Rodman operation done in two stages.

Had this plan been carried out through all my work, I have reason to believe that my total mortality in the twelve years' work would have been less than 3 per cent. instead of more than 5 per cent.

DISCUSSION ON THE PAPERS OF DRS. RICHARDSON, DOWNES AND COFFEY

Dr. J. M. T. Finney, Baltimore.—These papers are entirely too good to let go by without discussion. The Association is very fortunate indeed to have been permitted to hear these three papers, all of which are of exceptional merit in this very interesting field. I have nothing of value to add to what has been said. There are one or two points that seem to me to be worth while to speak of.

In the first place, the question of syphilis of the stomach is one that has interested me very much. I had one such case that I did not recognize until the pathologist brought it to my attention. It was the only one that I have had. The lesion was very like the illustration that Dr. Coffey has shown. It was a case in which I resorted to resection, thinking that I had a carcinoma.

The question of mortality rate in these operations is one that has interested me very much. I cannot help but feel, as Dr. Coffey does, that the real mortality rate is not known; that it is much higher than has been generally supposed. As to my own mortality rate, I took my first 100 cases of pyloroplasty, and my first 100 cases of gastro-enterostomy and compared them. I took the oldest cases so that we could follow them up and get the ultimate results. There is not much difference between the two. One or two of these deaths were the accidents of surgery. They could hardly rightly be charged up to the operation *per se*, but they must be charged against the mortality rate of course, because there are certain explanations that never quite explain, and one of them is to try to explain away any given mortality

rate. It is better to let it go as it is without any attempt at explanation.

I have come more and more to believe in excision of ulcer. I always make it a practice to excise every ulcer that I can, and where I cannot excise them I treat them. One of the chief advantages of pyloroplasty is that it allows one to do this. All ulcers on the anterior wall may be excised through the opening for pyloroplasty. In the posterior wall it is impossible to excise the ulcer unless you convert the operation into some form of a pylorectomy. I have lately been treating these cases of ulcer on the posterior wall just as we treat chronic indolent leg ulcers in the dispensary.

A good many years ago I made a series of experiments in the treatment of these ulcers and found that one of the chief reasons for failure to heal satisfactorily was the fact that the ulcer base was formed by a dense layer of fibrous tissue poorly supplied with bloodvessels. If you made two or three parallel or cross incisions in the ulcer deep enough to go through the fibrous tissue base, in a few days or a week you would see epithelium beginning to grow in from the edges along these lines of granulations, showing that the blood supply is an important factor. I applied this principle to the treatment of these ulcers on the posterior wall, everting them with my finger from behind, bringing them up into the wound, making crucial incisions down to and through the dense fibrous tissue base.

Another thing I have noticed in examining chronic ulcers is, that the epithelium grows better horizontally than vertically. Every surgeon knows this. The undermined edges of the ulcers I have excised to make them flat instead of cup shape, and then with a catgut suture or two. in order to stop the hemorrhage, I have brought the raw surfaces together and pretty completely obliterated the ulcer. I do not know how these cases heal, I have not had a chance to see a case postmortem. They have all gotten well from the immediate results of the operation, and it seemed to me that their recovery from the clinical symptoms was more satisfactory than those cases that had not been so treated.

I only use nowadays the operation of gastro-enterostomy where I cannot for any reason do a pyloroplasty, or where I am dealing with malignant disease. So that the mortality rate in my hands from gastro-enterostomy is unusually high, because it is always done in bad cases.

Dr. Charles H. Mayo, Rochester, Minnesota.—I think the idea is generally accepted that ulcers occur from hematogenous causes. By injuries of the nervous system, taking out the splanchnic nerves, the injection of enormous amounts of bacteria and by the removal of the adrenals, one can produce showers of ulcers, but they are not of the typical type that one would reproduce in a hematogenous way from bacteria grown from ulcers.

We do the Finney operation or gastro-enterostomy to cure people in the interval after food has left the stomach. Paterson has well shown that with gastro-enterostomy we lower the acidity, physiologically, 30 per cent. With reference to the question of gastrojejunal ulcer: In five of six cases of gastrojejunal ulcer we have found sutures after the primary operation. Even after four years the thread is strong enough to stand the traction and the drawing out of the ulcer. The induration back of it makes you think that in the raw ulcers there is nutrition from contact with the infective material leading into the tissues, rendering conditions favorable for ulcer.

Three years ago, in January, I began the use of catgut, and Dr. Will Mayo began the use of interrupted silk. Within six months he found in connection with gastrojejunal ulcer one single thread in the ulcer. I have seen gastrojejunal ulcers that did not have threads, though five out of six have threads in one or more areas.

Is there any real reason for using some kind of suture material for gastro-enterostomy which will hold for years? If it does hold, does it do any good?

Dr. Downes (closing).—I only want to say in reference to secondary operations, that in one of our syphilitic cases the ulceration was largely at the pylorus, and the gastro-enterostomy was so placed that we could do a pylorectomy at a second stage but the man improved so rapidly that he refused a secondary operation.

As for gastrojejunal ulcer, I have never recognized one of my own, nor have I reoperated for such, but I had one patient who returned with all symptoms in which we thought we would find gastrojejunal ulcer. We reoperated upon this woman and found that she had a second ulcer on the lesser curvature of the stomach one inch proximal to the site of the previous ulcer, but there was no ulceration at the site of the gastrojejunal opening.

TRAUMATIC ASPHYXIA

By J. Garland Sherrill, M.D., F.A.C.S.
Louisville, Kentucky

Traumatic asphyxia (pressure stasis, ecchymotic mask) is a condition of sufficient rarity to justify its consideration by this Association. The following case which came under observation recently has drawn our attention to the subject, especially since the injury producing it was somewhat unusual for such result:

October 21, 1916, W. L., a bridge builder, aged thirty-five years, was injured in the following manner: The top chords of a new truss were being placed in final position. L. was helping make the connection, when he was caught between the ends of the chords and squeezed, doubling him up and bringing his head down on his knees. The weight of the chords is very great, estimated by the patient that at least seven tons was the weight of the end which came down upon him. No accurate statement of the time this chord was pressing upon him could be obtained, but it must have been of brief duration.

When first seen, within an hour from the time of the injury, he presented marked ecchymosis and swelling over the head and forehead down to the malar bones. This area was dark purple in color and clearly delineated by an abrupt margin where the healthy color of the skin joined the swollen, discolored part. Pressure did not affect the discoloration. There was present a subconjunctival hemor-

rhage on each side, which was bright red, contrasting strongly with the purplish discoloration of the adjacent tissues—a striking appearance. Rupture of each ear drum with hemorrhage from the ear canal was noted. Bleeding also occurred from the nose. There was a bruise of the right shoulder, also slight bruises over the chest and abdomen of insignificant extent, and a fracture of the seventh rib on the right side. A very slight boss of the spine presented in the lower dorsal region, which was probably occupational, although the possibility of its having resulted from the injury was considered. There were no other evidences of spinal injury to confirm such a diagnosis. The patient was fully conscious and the reflexes were normal, with no evidence of cerebral injury. The pupils were equal and responsive to light and accommodation.

The diagnosis of traumatic asphyxia was confirmed by the subsequent history of the case. The discoloration of the skin cleared up promptly in about three or four days, that under the conjunctiva persisting much longer. The patient recovered without untoward incident, leaving the hospital November 8.

From the study of the literature at hand the conclusion may be reached that this condition usually results from sudden and forcible compression of the chest and abdomen, while the head and perhaps the extremities are not compressed. Usually the pressure upon the chest is in an anteroposterior direction, but it may be applied laterally. In the case herewith reported there is some question as to the direction and the character of the pressure upon the chest. It would appear that the chest was crowded forward upon the abdomen in such a way that respiratory effort was impossible. In addition to this, however, the neck was pushed forward firmly toward the chest, resulting in the constriction of the veins in the neck similar to that occurring from strangulation by hanging. This case seems

even more strongly than the others reported to show that the discoloration is due to increased venous pressure, although most observers have held that this is of prime importance, and acts on the superficial veins of the face and head because of the lack of tissue support and the incompetence of the valves. This contention is also supported by the fact that in the case reported by Bolt the discoloration occurred everywhere over the face and head except where a snugly fitting cap pressed upon the head. The same effect is shown by the pressure of the collar as noted in Winslow's case.

The pathology of these cases varies only in extent and degree, and depends largely upon the amount of compression and the length of time it continues. It consists in discoloration of the skin from venous distention or hemorrhage in varying degree; subconjunctival hemorrhage; rupture of the ear drum with hemorrhage from the canal; epistaxis and swelling of the skin, the latter and the discoloration also being limited to places that are not subjected to supporting pressure and usually extending no lower than the clavicle, although in some rare instances there is some discoloration in the axilla. Discoloration in the soft tissues disappears very promptly in the course of a few days; that of the conjunctivæ at times persists for several weeks. Coincident injuries, of course, make the other pathological changes different in each case.

There are usually no cerebral lesions present, although in some instances transient blindness has been noted. This has been attributed to the fact that the veins going to the brain are supported properly by the surrounding tissues, which is not the case in the more superficial veins. In the latter the inadequacy of the valves can be proved by the fact that the injection of the vena cava in the dissecting room distends the superficial veins of the neck, while those of the arms are unaffected.

The superficial observer would be likely to conclude that the discoloration was due either to asphyxiation, to subcutaneous hemorrhages, or local ecchymosis. The first theory can easily be refuted by the fact that the discoloration is distinctly localized, thus differing from asphyxiation. The second hypothesis that extravasations of blood take place as a result of the venous engorgement and pressure may be in part true, as shown by the subconjunctival extravasations and by the hemorrhages which take place from the ears and nose.

Hueter made experimental studies upon rabbits, and concludes that the discoloration is probably due to stasis of blood from mechanical causes: (1) The upward pressure of blood dilates the vessels of the face; (2) pressure on the sympathetic nerves of the abdomen and thorax leads to a paralysis of the vessel walls.

Perthes, after observing two of these cases, concludes that the cause of the discoloration is extravasation of blood, either minute subcutaneous effusions or hemorrhages. He concludes also that following severe contusions with compression of the thorax, marked effusion of blood may occur in the head and its neighboring tissues without other evidence of any injury to the head itself.

Beach and Cobb, from the examination of skin taken from the living patient, concluded that there were no hemorrhages of any size whatever into the skin, and that the discoloration was due to a stasis from a mechanical overdistention of the veins and capillaries with or without paralysis from engorgement or to pressure on the sympathetic nerves.

It seems to the writer, however, that their conclusion is only in part correct, since the hemorrhage from the ears and nose, recorded in a number of cases, would point to the possibility at least of hemorrhages into the subcutaneous

tissues as well as into the subconjunctival space, which has been noted in a number of instances. It would appear more probable that in the cases of minor degree the discoloration may result from the distention of the veins without extravasation, while in the more severe forms the possibility of hemorrhage into the tissues must be admitted.

The symptoms of this condition are marked discoloration in the skin of the head, face, and neck, extending down to the clavicle. Posteriorly, there is in some cases marked extravasation over the trapezius muscles. The ears are sometimes not involved, neither is there discoloration nor swelling under a tightly fitting cap, nor where the pressure of a collar supports the neck. The conjunctivæ are very red and in striking contrast to the purple, mottled appearance of the remainder of the skin. The lips and tongue may be somewhat swollen, and together with the mucous membrane exhibit the same purplish tint as the skin, and hemorrhages may occur from the nose and ears. The patient may be momentarily unconscious, although this symptom is not frequently seen, and disappears in a short time. Of course, one must not overlook the possibility of concomitant injuries of a serious nature in these cases. The discoloration usually disappears rather promptly, except that under the conjunctivæ, which persists for a longer time.

The prognosis is usually favorable, recovery taking place in most cases quite promptly. It will depend, of course, to a large degree upon the amount of pressure and the length of time which it is applied, as well as the gravity of coincident injuries. From the nature of the injury and its manner of occurrence, surgical aid can rarely be had immediately; however, when possible, the immediate use of artificial respiration and oxygen should be employed. Usually shock is slight, except where the accompanying

injuries are severe. The subsequent treatment should consist in combating shock if it is present, keeping the patient at rest, and meeting indications as they arise.

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DISCUSSION

Dr. Randolph Winslow, Baltimore.—I have had the opportunity of seeing three of these cases. Recently Mr. Linington, a surgeon at Folkstone, England, at the request of Dr. Osler, sent me the London *Lancet* containing an account of a case that came under his observation and a beautiful picture which I here show you.

The first case I saw occurred in my service at the University Hospital in 1904. As Dr. Sherrill has said, the line between the discoloration and the clear parts is well defined. This person was standing on top of an elevator, the elevator went up suddenly and caught him and almost bent him double. He came down upon his knees in a forcibly bent condition. He sustained various injuries, such as a lacerated rectum, fractures of the ribs, and so on, but the most noticeable feature was the wonderful discoloration of the face, which was most alarming to look at, and I recognized it as being a case of traumatic asphyxia from having read an account of it by Cobb and Beach, of Boston. The man recovered.

The next case also occurred in the University Hospital in the service of Dr. Frank Martin. In that man's case conditions were reversed a little in regard to the injury. The elevator came down on top of him instead of going up from beneath him. The injuries sustained were practically the same. You see the upper part of the countenance looks as if he were a negro, while the lower part is that of a white man. These photographs do not show the actual condition which I hope to show in a minute on the screen. There is an absolute blue discoloration; it is punctiform, except that scarlet fever is red, as you see in cases of scarlet fever.

This is the case of Mr. Linington, of Folkstone, England. In this case there was forcible compression of the abdomen forcing the blood from the liver and great organs of the abdomen upward through the vessels of the neck, which are poorly supplied with valves. It is stated that the patient had a cap on, so that the discoloration did not extend beyond the area covered by the cap. The same is true of the other cases we have seen. Fortunately the man recovered.

A third case that I saw, which did not recover, was the result of a crushing injury. The patient was a railroad workman, who

in unloading a car, in some manner was crushed between bags of cement which fell upon him.

My experience with these cases is perhaps rather large as one does not see many of them during his practice. While these patients usually recover, a certain number of them die.

Dr. Francis Reder, St. Louis, Missouri.—In connection with the interesting cases that have been reported of traumatic asphyxia, I wish to report one which is somewhat different from the clinical history that the essayist has given us. This patient, a workman about twenty-six years of age, was struck on his head by a joist. He was immediately taken to the hospital. There the receiving surgeon reported him as unconscious and in a moribund condition. Upon examination only an indistinct pulse could be obtained.

The respiratory movements had ceased. Examination of the head disclosed a hematoma over the right parietal region. No visible skull fracture nor any other injuries to the body. Face and neck down to clavicular regions, right and left sides, were bluish in color. Artificial respiration was resorted to. Response was good and in a short time the patient became semiconscious.

However, upon ceasing with the artificial respiration the patient immediately lapsed into a state of unconsciousness with the characteristic discoloration of the face and neck to the clavicular region, so clearly shown in the pictures of Dr. Winslow. Artificial respiration was continued until all available help was exhausted. A pulmotor was sent for. It rendered good service and kept the patient alive during the ten hours it was in use. As soon as the pulmotor action was discontinued the patient lapsed into unconsciousness with a return of the bluish discoloration of face and neck.

At 9 p.m. of the same day after a consultation of the hospital staff it was concluded to decompress the occipital region, as a fracture at the base of the skull and possibly a blood clot was suspected.

This procedure was carried out and a large blood clot at the base of the brain was removed. The patient died about one hour after the operation.

The case presents an interesting feature relative to the respiratory center. This center was paralyzed through pressure. As long as air was introduced into the lungs in an artificial manner, the patient lived. He was kept alive in this manner for almost fourteen hours. With its discontinuance the patient died.

If the blood clot would have exerted its pressure only in one-half of the medulla, there would have been a possibility that the patient could have lived. The respiratory center is bilateral and if the medulla is severed in the midline, respirations may proceed in a normal way. The center consists of two parts, each connected primarily with the musculature of its own side. As it happened the blood clot was pressing upon both parts of the respiratory center, and when the operative measure was instituted the damage done placed the respiratory center beyond recovery.

Dr. Sherrill (closing).—I have nothing to add except that in all these cases the concomitant injury may be of a major character. We know that all these cases are extremely alarming. The report went out before I saw this man that he was dying, and I was very much relieved to find he was getting well a short time after I saw him.

CHOLECYSTITIS WITH AND WITHOUT GALL-STONES WITH A CLASSIFICATION OF SYMPTOMS

By G. A. Hendon, M.D., F.A.C.S.
Louisville, Ky.

This study is based upon 30 personal cases. The following facts are deduced by analysis of the group.

Sex. There were 19 females and 11 males, or approximately two-thirds women and one-third men. The average age was forty-one years. The oldest patient was seventy years; the youngest in this series was twenty-nine. I have operated on a girl, aged sixteen years, but her case is not included in this report. The cases with reference to decades are divided as follows:

20 to 30	6	cases or	about	20	per cent.
30 to 40	13	"	"	40	"
40 to 50	6	"	"	20	"
50 to 60	2	"	"	7	"
60 to 70	3	"	"	10	"

Stones were present in 18 cases, or 60 per cent.

History of "stomach trouble" existed in 25 cases, or 83 plus per cent.

Average time from earliest symptom to date of operation was ten years. The longest period was twenty-nine years, the shortest was two days; 9 cases, or 30 per cent., were jaundiced at some period in the history of the complaint. The jaundice occurred in 1 case in which no

stones were found. Stones were found accidentally in 2 cases during the process of an operation for other trouble, and were unsuspected before the operation; 1 was a fibroid of uterus and 1 acute appendicitis. There were 3 deaths; one in which the patient vomited incessantly from the moment she came out of the anesthetic until she died forty-eight hours later. This case was operated upon in a hospital in a neighboring city. I did not see her again after the operation. It was quite a difficult case, in which a contracted dry gall-bladder filled with stones had to be resurrected from a mass of adhesions deeply situated beneath the liver. The second case is herewith reported in detail. Death took place eight weeks after operation for rupture of the gall-bladder. Case 3, I think, died as result of a defect in drainage.

History of typical colic occurred in 22 cases, or 73 plus per cent. In 5 there was typical colic but no stones. Two cholyecystectomies were performed, 1 primary and 1 secondary. The latter case was not relieved by cholecystostomy and removal of sixty stones, with drainage, but upon her return home she continued to have periodic colic attacks as severe and as frequently as before the operation. She came back to the hospital in six months and cholecystectomy was performed; no stones were found at the second operation, and complete relief of symptoms ensued. One other patient in whom a single stone was removed complained of "stomach trouble" after the operation. So far as morbidity is concerned no other cases have returned to me with a complaint. This fact is far from proving that all my cases were utterly relieved for two reasons: one is that many patients will endure much suffering rather than risk the ordeal of a second operation. When the first operation fails to relieve, patients rarely return to the surgeon who failed of relief in the first instance. It is but natural they should seek other counsel.

The longest period in the hospital of the present series was four weeks, the shortest was two weeks. The average for twelve cases was three weeks.

Symptoms. *Stomach Trouble.* 1. A review of the symptoms shows that "stomach trouble" is the most constant, occurring in 83 plus per cent. of the cases. It appears therefore that stomach trouble is almost synonymous with gall-stone disease. I think that on account of its prominence as well as permanence it deserves special consideration. I shall, however, confine myself to the clinical rather than to the laboratory phase, and in doing so I hope I do not convey the impression of a tendency on my part to over-estimate the importance of the clinical side or underestimate the value of laboratory methods. Both arms of the service are indispensable to the requirements of diagnosis, and whoever slights the one or shows special favoritism for the other is sure to fall into serious error if not complete disgrace.

2. For those of us who work in a relatively isolated way the clinical symptomatology holds a more vital interest than it does for those connected with large coöperative organizations in which the segregation of labor goes a great way in the solution of the complex problems of diagnosis. Clinical symptoms make a strong appeal to the individual worker, because by their aid he may be able to classify his cases into those who do and those who do not require laboratory investigation. It is wholly impractical to make routine laboratory examinations of the stomach of every patient who applies to a monogamous clinic.

3. The careful study of the clinical phases of disease always reveals certain fundamental principles of diagnosis. The objective phenomena observed upon the patient himself, his own recital of subjective symptoms, his own narrative of the history of his complaint, and the irresistible element of personality which is thereby injected into the

sketch make a combination upon which all further investigation may be based.

4. In numerical strength, so-called dyspepsia heads the list of human complaints. Nine of every ten patients who enter a doctor's office either have or think they have what is vaguely denominated by them as stomach trouble, yet paradoxical as it may seem about one in every ten people who think they have stomach trouble actually have a gastric disturbance; and though it may sound whimsical, it is none the less true that it is more difficult to cure the delusions of those who think they have stomach trouble than it is to cure the lesion of those who actually have it.

5. That indefinite (and I might say that infinite, I am tempted to go a step farther and say that infamous) diagnostic masquerader, indigestion, is a term used by the laity for expressing a variety of ailments ranging from pregnancy to locomotor ataxia. When a patient enters a doctor's office and complains of indigestion he lays upon his consultant the task of discovering whether he is afflicted with gall-bladder disease, pancreatitis, appendicitis, cirrhosis of the liver, renal calculus, hemorrhoids, meningitis, error of refraction, Pott's disease, or a host of other maladies which it would be both tedious and tiresome to enumerate.

There is also some diagnostic weight to the fact that excepting the spleen and the malady of cancer the stomach is the seat of primary pathological changes less frequently than any other organ inside the abdominal cavity. We have discovered by clinical experience and by the modern methods of precision in diagnosis that diseases of the stomach are much fewer in number than was formerly supposed, excluding alcoholic and accidental corrosive gastritis. The only lesions occurring in the stomach with sufficient frequency to be of practical importance are ulcers and their sequelæ and cancer.

Typical colic occurred in 22 cases or 73 plus per cent. and ranks next in importance to stomach trouble as a symptom, but its positive value is depreciated by the fact that there were 5 cases in which it existed and no stones were present, and 2 cases in which stones were present but unsuspected, the abdomen having been opened for other conditions.

Gall-stone colic is often classed as acute indigestion by patients and physicians. Cases of colic in this group may have unwittingly fallen under the head of stomach trouble.

A report is made of the following cases because they present certain features of interest and illustrate certain phases of the disease.

CASES WITHOUT PREVIOUS HISTORY

Case 1.—Mr. G., aged fifty years, had typhoid fever twelve years ago; had not been sick since then. He was suddenly seized in the middle of the night with agonizing pain in the epigastrium. He called a doctor, who gave him morphin and kept him narcotized three days. I saw him at that time and operated for gall-stones. The gall-bladder was found enveloped in omentum and mesocolon. It was black in spots and showed signs of impending perforation. The enveloping fold of omentum was gangrenous in most of its extent, as was certain areas of the mesocolon in contact with the gall-bladder. The gangrenous omentum was amputated. The gall-bladder was opened; it was much enlarged and under tension. It was filled with pus. No stones found but extended search was not made on account of patient's condition. The mucus and muscular coats of the gall-bladder were almost ready to slough. They lay in separate layers from each other and from the serous coat also. Drainage was instituted. The drain tube came out on the twelfth day after operation.

When the tube was removed a large stone appeared in the wound. After three attempts made on separate days to crush and remove the stone it was finally extracted under ether and found to be only one large stone.

Case 2.—Mrs. M., aged fifty years, was suddenly seized with pain in the abdomen without premonitory symptoms. Operation two days after onset. The gall-bladder was highly inflamed and contained a single stone, which was remarkable for its size, its symmetry, and clear crystalline formation.

These two cases are of interest because there was no previous history of indigestion or pain, and there was a single stone of large size in each which had remained certainly a number of years without trouble.

EFFECTS OF LONG PERIOD OF GALL-STONE DISEASE

Two cases are herewith cited to illustrate this phase.

Case 3.—W. E. S., farmer, aged forty-seven years. Present attack occurred two days prior to the operation and followed a heavy meal. He had been having at frequent but irregular intervals attacks of gall-stone colic covering a period of twenty-five years. The attack had grown more frequent in recent years. He suffered during all that time with indigestion and sour stomach; could not eat tomatoes and often regurgitated his food. Had typhoid fever two years ago and was in bed three months. At operation the gall-bladder was distended to its utmost; one spot the size of a dime seemed about to slough out. The gall-bladder was filled with stones the size of garden peas, about sixty in number.

Case 4.—Mrs. B., aged sixty-one years. Had been suffering with gall-stone attack during a period of twenty-nine years. She was severely jaundiced at time of operation. The gall-bladder was small and contracted and con-

tained about a half dozen stones, cholecystectomy was done. The gall-bladder was found to have sloughed where it lay in contact, with the liver and the stones nestled in a cavity in the liver structure covered by the remains of the gall-bladder. In dividing the cystic duct to remove the gall-bladder the hepatic duct was also divided. I anastomosed its proximal end to the cystic stump and ligated the distal end. I protected the anastomosis with a rubber fish-tail tube drain, securing it in place with No. 00 catgut. The patient made a satisfactory recovery, the drainage ceasing in about four weeks.

CASE IN WHICH ULCER SYMPTOMS SEEM TO PREDOMINATE

Case 5.—Mrs. W. E. S., aged thirty-eight years, married; one child stillbirth at term eleven years ago, from which time she dates her present trouble. She began with bilious spells, nausea, and vomiting of bile; sometimes the attacks were accompanied by cramps below the umbilicus; every menstrual period was associated with a bilious spell and cramping. Eight years ago she consulted a celebrated internist, who diagnosed ulcer of the stomach and placed her upon rectal alimentation fifteen days; she improved some, but continued to have the "bilious spells" at each menstrual period. Has backache most of the time. Has never regurgitated, but the presence of food always causes distress, which is worse at periods varying from one-half hour to three hours after food ingestion. She is addicted to the use of the stomach tube, and practices autolavage whenever she feels the discomfort of food, and obtains temporary relief. Occasionally when the attacks are very severe she resorts to morphin hypodermically. She had typhoid fever at twenty years of age. The abdomen was soft but very tender over the left ovary and gall-bladder region. Vaginal examination shows uterus tender

and fixed and a mass in the cul-de-sac. The cervix was badly lacerated. Gastric analysis showed no abnormality; urine normal; leukocyte count, 75,000. At operation the abdomen was opened below the umbilicus and a sero-sanguinolent cyst of the left ovary was removed. The appendix looked a little sick and was removed. The gall-bladder was palpated and found to contain one stone about the size of the last joint of the little finger; another incision was made over the gall-bladder and the stone removed. The stomach and duodenum were examined with great care and found free of ulcer or ulcer scar. She made a good convalescence, and at last accounts was well except a little "indigestion" now and then and the complaint of being very nervous.

This case shows how one can fall into error by following the lead of "stomach trouble." Her husband told me he had kept books on his wife's illness, and that during the eleven years had spent $3000 treating her for a disease she did not have.

ONE FREAK CASE

Case 6.—J. E. K., aged twenty-six years; sorter in laundry. He went to work as usual on Monday morning. While at work he was suddenly seized with pain in the region of the gall-bladder and went home and sent for his doctor. Two days later he was admitted to St. Anthony's Hospital. His pain was excruciating; pulse, 120; temperature, 101.6. A tumor was perceptible in the gall-bladder region. Incision showed the gall-bladder very black and distended; when opened it was found filled with blood-clot. There were no stones present. He made a smooth convalesence and left the hospital in three weeks. He died one year later from nephritis. No examination of the urine was made while he was in the hospital, because

he came in as an emergency and was operated upon within two hours of admission. The convalescence was so smooth that no suspicions were aroused regarding the kidneys.

RUPTURE OF THE GALL-BLADDER

Case 7.—Mrs. D., aged fifty years; mother of two children grown. She has had numerous attacks of gall-bladder colic over a period of two years. I was called to see her in quite a number; she steadfastly refused to consider operation. In the early part of November I saw her at 5 A. M. in what appeared her most severe attack. The pain was great and evidence of profound shock was apparent. Soon the signs of peritonitis became conspicuous. Her abdomen became distended. Vomiting set in and the pulse went to 160. The focus of her trouble was defined by a mass in the right side, where the gall-bladder is usually found. There was a gradual decline in the severity of symptoms from day to day until, on Christmas day, seven weeks after the inception of the attack, she was able to sit up. The mass in her side was still discernible as plain as before. The temperature by this time was ranging from 99¼° A. M. to 101° P. M. She slowly gained strength and appetite and lost the pain, but the temperature kept up. During the third or fourth week of her illness she evacuated large quantities of pus and decomposed blood from her bowels.

She was operated on February 28, 1913. Incision as for opening the gall-bladder was made, and through the opening search was made for the gall-bladder. We first encountered a wall of omental plications, which was attached to the parietes along the right side as far down as the upper border of the ilium. This was separated and the search extended beneath until the remnants of the gall-

bladder were disclosed. It presented the apparance of a total wreck. The walls were thick and curled inward. I did not attempt to disclose the communication with the bowel, but I presume something of the sort existed or did exist prior to the operation. There was quite a large hemorrhage that followed the exploration. Two drains were carried to the bottom of the cavity and the abdomen closed. Discharge of very offensive thin pus and bile began the next day, and on the third day expectoration of pus began and lasted only one day and night. The discharges gave almost pure culture of colon bacilli. She returned to her home four weeks after operation, but the discharge never entirely ceased, and she succumbed four weeks later with symptoms of systemic sepsis.

RECURRENCE OF GALL-STONES

By John B. Deaver, M.D.
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Every experienced surgeon finds himself confronted with the question of recurrence of symptoms requiring secondary intervention after operation for the relief of gall-bladder or biliary conditions. As in other questions, perhaps a free exchange of views may help toward the solution of this vexed problem.

About 4.07 per cent. of the cases of biliary affections operated on by me at the German Hospital of Philadelphia were secondary cases, *i. e.,* such as had had one or two or even more, previous operations performed by me or by other surgeons for gall-stones or other disorders of the bile passages in periods varying from seven months to seventeen years; the greater number (60 per cent.) required reoperation within one year after the primary intervention.

In a recent publication * I have presented the results of a study of 1031 operations performed by me from January, 1910, to January, 1916, with a mortality of 7.18 per cent., including 42 recurrent cases in the series. More recent figures (January, 1916, to November 1, 1916) give about the same percentage of recurrent cases, but a somewhat higher percentage of operative deaths. In 152 operations there were 15 deaths, and 8 patients who had had one or two (one case) previous operations for gall-bladder disease.

* Illinois Med. Jour., June, 1916.

The patient having a history of two previous operations was also the one who had had the longest interval between operations: the first a cholecystostomy, having been done seventeen years, and the second, a cholecystoduodenostomy, fifteen years before the present operation.

In addition to the 1183 operations, referred to above, all of which were done in my clinic at the German Hospital, there were 642 in this clinic prior to 1910, making a total of 1825 operations on the biliary passages. My total number of operations is considerably more than this, as I have not included those done in former services at St. Agnes's, St. Mary's, and the Philadelphia Hospitals, and during the last five years' service at the University Hospital.

The most common cause of recurrence after cholecystostomy in the combined series was stone or stones in the gall-bladder (12 cases). Next in frequency were adhesions (8 cases) and stone or stones in the common duct (6 cases). In the earlier series 4 of the patients required reoperation after a cholecystectomy, 2 for stricture of the pancreatic portion of the common duct or the duodenal orifice, and 1 each for stone in the common duct and postoperative duodenal fistula. All the recurrent cases in the latter series resulted after primary cholecystostomy. This would make it appear that cholecystectomy, though the more serious operation, reduces the risk of future troubles. As I have stated elsewhere, however, under good conditions the mortality figures of the two operations do not greatly differ.

The failure to remove all the gall-stones at the primary operation is the most potent cause of recurrence of symptoms. This adds emphasis to the arguments we surgeons are continually bringing forth of the importance of early operation. Kehr, perhaps the greatest German authority on surgery of the gall-bladder, does not hesitate to lay much of the blame for recurrent gall-stones on the medical man.

He points out that in long-standing cases the gall ducts become dilated and stones are apt to lodge in the recesses, so that they cannot always be removed or even detected at operation, and thus give rise to renewed attacks of cholelithiasis. Operation, says Kehr, in cases in which inflammation is limited to the gall-bladder may be postponed for a few weeks or months, but in cholangitis it should be resorted to after a second attack before the ducts have had a chance to dilate. There are, of course, operators, he says, who fairly court recurrence by their method of operation, but the surgeon who gets a chance to do an early cholecystectomy and drains the widely incised choledochus is only rarely confronted with a recurrent case. In the matter of free and prolonged drainage of the biliary tract I heartily agree with Kehr. I regard it as the best means of overcoming recurrence, and I make it a practice to use large-sized tubes and allow them to remain *in situ* until they practically drop out.

It is not always easy to determine whether these recurrent stones were overlooked at operation or whether they had actually formed again after operation. The impression, however, is strong that in a few instances at least reformation had taken place, inasmuch as the number of stones in some of the cases ranged from five or six to several hundred, which could hardly have escaped detection. On the other hand, it is not always possible to clear the two primary branches of the hepatic duct. Again, as in the attempt to remove a stone or stones from the hepatic duct, one or more may be displaced upward beyond the reach of the surgeon and thus later produce a common-duct obstruction which requires reoperation. I have had cases in which I have removed muddy, granular material from the gall-bladder and have been obliged at a later date to operate for obstruction of the common duct. I have also seen cases which required several operations before a per-

manent cure was established. These were cases of cholangitis, or better perhaps, cholangiolitis. Here also complete and prolonged drainage is essential for a cure, and we should not hesitate to open the common or the hepatic duct to secure it.

I would like to call attention to the advantage of the T-tube in cases in which prolonged drainage of the common duct is necessary. I have found it especially valuable in chronic cholangitis and in cases complicated by a more marked pancreatitis. This arrangement can be likened to an artificial gall-bladder of infinite distensibility, and while it is in place it is impossible for the bile to be retained in the bile ducts and stagnate under tension. The tube may be allowed to remain for any length of time that is desired and until one is assured that the biliary tract has thrown off the infective process. These tubes should be carefully constructed. I have recently had a case of cholecystitis with pancreatitis in which I removed the gall-bladder and instituted drainage through a T-tube. Drainage was never free, and finally, in about two weeks, stopped entirely. All efforts to clear the tube by suction and introducing fluid were unavailing. On removing the tube it was found that at the junction of the two arms of the tube the lumen had been almost obliterated by a diaphragm of rubber. A sandy deposit had completed the obstruction. Since removing the tube the patient has had symptoms suggesting those for which he was operated upon, and in the absence of his gall-bladder are undoubtedly due to the pancreatic lesion. This observation also supports the undoubted efficacy of biliary drainage in the cure of chronic pancreatitis.

Frequently associated with numerous minute stones in the common, the hepatic, and the smaller bile ducts, with occlusion of the papilla of Vater, is biliary cirrhosis; this condition I have frequently met with, and have found that

only prolonged gall-bladder or common-duct drainage will suffice to bring about a permanent improvement or cure. That cases of this type can be given as good a chance for improvement or cure by medical treatment, including that given at the various famous springs, to my mind is preposterous. Anyone who has seen and studied the operative findings cannot but agree with me *in toto* in this statement. It is only the medical man, who has seen in a half-sort-of-way, one such case, that may not be convinced. This reminds me of a remark made by the late Dr. McBurney in discussing a paper on appendicitis, when he said, "Lord deliver me from the man who has had a case!" Those of my onlookers who have seen me upon many occasions delve into the primary hepatic ducts and scoop out muddy, sand-laden material have, with me, concluded that recurrence would surely occur. How any medicine could clear the bile ducts of this material I cannot see, yet these cases are frequently subjected to prolonged medical treatment.

It is well known that the chronic affections beget gall-stones while the acute infections cause destructive lesions. Chronic cholangitis must be reckoned with in the study of the causes of recurrence of symptoms. Citation of the following case will illustrate this point:

Case History.—Mrs. X, aged forty-five years. Recurrent attacks of biliary colic with jaundice covering a period of one year, during which time she was treated medically. When I was asked to see the patient I found her feverish, with accelerated pulse, profoundly jaundiced, suffering constant pain, with an enlarged liver and a painful and palpable gall-bladder. I advised immediate operation. This showed an inflamed gall-bladder distended with stones and the common and hepatic ducts filled with stones. The gall-bladder was removed, the common duct opened and fifteen stones removed from the common and the hepatic ducts. With a small scoop many very small stones were removed

from the primary hepatic ducts; the papilla of Vater was strictured, necessitating dilatation with graduated probes. The common duct was drained. Culture of bile showed colon bacillus. The patient made a stormy recovery. The drainage was removed in eight weeks. She remained well for one year, when she was again the subject of practically the same symptoms as before operation.

The second operation showed numerous small stones in the common and hepatic ducts. Again the ducts were cleared as well as could be done and common-duct drainage made. Again recovery, remaining well for a little over a year, when she suffered from an attack of cholangitis that that has improved but has not entirely cleared up. It is too plain what the future of this patient will be. I have advised further operation and drainage of the common duct for an indefinite period. I have one patient wearing a T-tube now going on three years, who is perfectly well and will not listen to removal of the tube, having had two previous operations. I have a number of patients wearing these tubes upon whom I have made the second or third operation; all of the patients are doing their work as they did before being attacked. The majority of the patients are poor women, housewives, and are able to attend to their household duties. In this class of cases, in which the cystic duct is patulous and the gall-bladder can be left, I consider drainage by way of the gall-bladder the best and safest method.

I cite these cases as one of the several causes of gall-stone formation. Minute stones imbedded in the mucosa of the gall-bladder can only be removed by taking out the gall-bladder; this may be unfortunate from the stand-point of the future of the patient in the event that obstruction of the common duct should occur.

Other cases in the series showed renewed exacerbations of infection of the gall-bladder of the ducts through failure

of the operation to have removed all the infection, as indicated by the presence of acute or chronic cholecystitis, chronic cholangitis, and pancreatitis at the subsequent intervention. Some of the less common causes of recurrence of symptoms were obstruction of the papilla of Vater, biliary fistulas, internal and external, and interstitial pancreatitis and pancreatic lymphangitis.

The rôle of adhesions in producing persistent or recurrent symptoms after operation upon the biliary tract is difficult to solve. It is my experience that adhesions of greater or less extent are formed after all such operations without exception. Without doubt many minor discomforts can be attributed to this cause. As this series shows, however, it is rare for adhesions *per se* to give symptoms of sufficient severity to warrant operation. Practically all recurrences of any moment, barring gall-stones which are left at the primary operation and cannot truly be considered as recurrences, are due to recrudescence or renewal of infection either in the biliary tract or in the most closely related organ, the pancreas. In the absence of infection or mechanical obstruction the great majority of adhesions are benign. Still, it must be admitted that adhesions are undesirable sequels of operation, and are at times productive of symptoms that are more or less serious. We should bear this in mind in operating. There is no preventive of adhesions. The various fluids and membranes that have been recommended for this purpose have all been disappointing, and often have actually aided the very process they were intended to inhibit. Much may be done, however, by limiting the trauma to endothelial surfaces at operation and dispensing, so far as is consistent with safety, with drainage tubes or gauze. In fact, I never use gauze drainage in this type of surgery. The gall-bladder fossa may be oversewed and brought together accurately by a running knotted suture, so that this raw surface will invite

few adhesions or none. Rough sponging should be avoided, and the dissemination of bile, blood, or infected fluids carefully prevented. With these precautions the rôle of adhesions in postoperative troubles will be small and of little practical moment.

In considering the causes of recurrence of gall-stones we must necessarily revert to the primary causes of gall-stone formation. Although Aschoff and Bacmeister believe that they have demonstrated the aseptic formation of the radial cholesterin stones in the gall-bladder, they at the same time show that all other gall-stones, the complex ones and the cholesterin-pigmented calcium stones, owe their origin to infection and obstruction. To my mind every gall-stone is, in the words of Moynihan, "A tombstone erected to the memory of the bacterium which lies dead within," and is what our lamented colleague, John B. Murphy, called an "infection sequence." Murphy further states that the cholesterin, which forms 98 per cent. of all gall-stones, is the product of dead epithelial cells lining the gall-bladder, and the stones by their presence in a more or less infected zone cause a continual deposit of cholesterin, which thus continually increases the number of stones, "until finally there is the arrest of a microörganism of a more virulent type which starts suppuration in the gall-bladder." This agrees entirely with the autopsy *in vivo,* which finally is the strongest argument. The internist and the gastro-enterologist form their conclusions from the outside plus laboratory findings, which make their results more or less uncertain. Were it not for the thickness of the abdominal wall between their eyes and the lesion they would be as wise as the surgeon. The infection when distributed over a great area of mucous surface will result in a large number of gall-stones, for "as ye sow so shall ye reap."

We all know that infection is carried to the gall-bladder

in various ways, the portal circulation, the common duct, the lymphatics, the systemic circulation, and by juxtaposition. The selective action of certain virulent bacteria from a distant focus, for the appendix has been brilliantly demonstrated by Rosenow. My experience extending over a number of years, and comprising, in the last six years, practically 1200 cases for affections of the biliary passages, convinces me that the appendix, in turn, is the focus of infection for nearly all upper abdominal diseases, the gall-bladder affections, gastric and duodenal ulcer, pancreatitis, etc. It is hardly necessary for me to dwell upon the importance of early removal of even a slightly troublesome appendix in order to avoid future trouble. Nor before a body of this kind need I do more than point out that the destructive possibilities of appendicular infection have no limitations, and this may practically also be said of infection of the bile passages. From the confusion still reigning with regard to the etiology of malignancy we are able to gather at least this, that carcinoma is the result of irritation. Ergo, remove the irritation. The fact, also, that 85 to 95 per cent. of primary carcinoma and only 15 to 16 per cent. of secondary carcinoma of the gall-bladder are associated with gall-stones indicates that gall-stones are the cause and not the result of carcinomatous degeneration (Kehr), and is another argument that speaks for itself. The further pernicious results of neglected gall-stones are seen in myocarditis and kidney degeneration, the two most important factors, to my mind, in the postoperative prognosis of these cases, as well as in degeneration of the blood-vessels, diabetes, hematogenous infection, etc.

Whether we can avoid the formation and the recurrence of gall-stones by a cholesterin-free diet, as recently suggested by our friend Gerster, remains to be seen. As for the practice of sending this class of patients to the various springs for treatment, this appears to me very much like

the repentant attitude of the young woman about to undergo an operation. Before being taken to the etherizing room she turned to her husband, saying: "My dear, if I have ever done anything to vex and offend you, and I know I have, I want you to forgive me." And in the next breath she added, "But if I come out of this all right I'll do it again, I promise you." These patients may come out of their troubles all right for a while, but they are sure to have it again, sooner or later.

Disease of the biliary passages is essentially surgical and not medical, and the most common preventable cause of recurrences is late operation. Until this fact has impressed itself indelibly on the physician as well as on the layman, we cannot expect to improve our percentage of complete cures of gall-bladder and associated diseases.

Gall-bladder Operations 1916		Died.
Number of operations	152	15
Recurrences	8	1
Type of Operation		
Cholecystectomy	93	4
Cholecystectomy and dochostomy	31	6
Cholecystostomy	20	3
Cholecystostomy and dochostomy	2	1
Cholecystostomy, dochostomy and pancreatostomy	1	..
Choledochostomy	4	1
Cholecystoduodenostomy	1	..
	152	15

Recurrences after Primary Cholecystostomy	
Causes:	
Stones in gall bladder	2
Stone or stones in common duct	1
Adhesions	4
Dilated common duct	1
	8

DISCUSSION ON THE PAPERS OF DRS. HENDON AND DEAVER

Dr. J. M. T. Finney, Baltimore, Maryland.—I said about all I had to say in regard to gall-stones and gall-bladder trouble a year ago at Cincinnati. I think I had the pleasure of starting a good discussion at that meeting.

It is always a great handicap for any one to follow John B. Deaver. There really is not very much to say. I cannot get up any argument on what Dr. Deaver has said this morning, and I shall not attempt to. But there are a good many points with reference to the question of gall-stones which have not been settled. On occasions like this, we may perhaps go a step or part of a step, at any rate, toward settling some of these questions in the minds of a good many of those present. When we hear a paper like this, where we have the benefit of an analysis of 1200 cases that have been operated on, that have been studied and followed up carefully, when we have the records of the Mayo Clinic and those of a good many other clinics, it would seem as if pretty nearly the last word had been said, but it has not. Certainly, the average man in operating upon a supposed gall-bladder case has more or less difficulty in making the diagnosis before operation. I have not yet found any one who is always cocksure about the diagnosis in an upper abdominal case, and I have usually noticed that the fellow who was cocksure was the one who not infrequently fell down. I am not going into the question of diagnosis; but there are three conditions, at least, in the upper right quadrant of the abdomen that are all the time getting mixed up, namely, ulcer of the stomach and duodenum, and affections of the gall-bladder and appendix. In a good many cases that I have operated on, where the operation has been done through an upper right rectus incision, I have had at the time only a vague idea in my mind as to what the diagnosis really was. I will leave that question right there excepting to add this: the cases in which one operates and finds a very definite pathological lesion are those, as a rule, in which one has the least difficulty in making a diagnosis beforehand. There is a group of cases where patients come to us with gastric or biliary symptoms, or some trouble in the upper abdomen that is more or less definite. Before the abdomen is opened we do not know what is the trouble. After

the abdomen has been opened and we look in, we often do not know much more. We can frequently tell what the trouble is not, when we are unable to tell what it is. Here, for instance, is an appendix. You look at it and you find it is not normal, and you take it out as a prophylactic measure. So far, so good. You look at the gall-bladder. It does not look any too healthy and yet not very abnormal. What are you going to do with it? Take it out or drain it? You have authority for either. I am old-fashioned enough to feel, at any rate, that up to the present time one ought to have very good reasons for sacrificing any organ. I think there are good reasons for taking out the gall-bladder as well as the appendix. I think Dr. Deaver has given us good reasons for taking out the appendix. What about the gall-bladder? It does not seem to me that one can put the gall-bladder and appendix in the same class. I do not see how that argument holds. The burden of proof is on the one who says that "the gall-bladder is a vestigial organ," that "it has no function," that "it is no good anyhow," and "you had better get rid of it." I say the burden of proof is on the one who assumes that position, and it does not seem to me he has proved his position at the present time beyond a reasonable doubt. Unless there is some good pathological reason; unless, in other words, the gall-bladder is clearly physiologically down and out, personally at the present time, I would rather leave it and trust to nature and drainage and the much-despised medical man to help out. It is an easy thing to take out a gall-bladder. Dr. Deaver is perfectly right in saying that it does not add much, if anything, to the risk. Formerly, we only took out the gall-bladders in the bad cases, so that the mortality was always high in resection of the gall-bladder. Things are reversed now and we take out the gall-bladder in the good cases and drain it in the bad ones, so that the comparison of older with more recent statistics is misleading. Dr. Deaver has stated as the usual experience that the operative mortality rate does not vary much in the two operations whether you take the gall-bladder out or not.

When it comes to the stomach and duodenum, I sometimes find it difficult to tell whether or not there is ulcer. I do not know whether or not others have had the same experience, but I find great difficulty sometimes. Here is a pylorus that is a little bit spastic; you find it in a good many cases. You have an irritating appendix or gall-bladder, and you will find frequently

associated with it a spastic pylorus with quite a little hypertrophy. I have not yet acquired that erudite touch of my fingers to tell whether or not we have an early ulcer. A chronically thickened ulcer, with a good deal of fibrous tissue you can always feel. You can see old scars. But there are certain cases where one cannot tell—at least, I cannot tell—whether there is ulcer present or not I have repeatedly done a pyloroplasty which was indicated, it seemed to me, by the spastic condition of the pylorus, when the individual had the clinical symptoms justifying it.

We ought to get the patient well if there is any way of doing it. So it happens that I have opened the stomach sometimes and found an ulcer, and sometimes I have opened it and have found no ulcer when the conditions beforehand were just about as definite in the one case as in the other. These are some of the problems the abdominal surgeon has to deal with. They are real. It is really a difficult situation in which one occasionally finds one's self. In the first place, our inability frequently to make a diagnosis from the clinical history. The *x*-ray man does not help us much in some of these cases. I have seen him fall down at times. The gastro-enterologist is not infallible. Your own senses do not help you very much sometimes after the abdomen has been opened. I find myself every now and then closing an abdomen wondering what really was the true explanation of the patient's symptoms. Sometimes they are relieved and you wonder whether it was because of or in spite of what you have done. It is probably sometimes one and sometimes the other. All these are real conditions, and a discussion such as this on the papers we have heard today is a very excellent way to help clear up some of these perplexing questions.

I have not operated on 1200 cases of gall-stones as has Dr. Deaver, but I have operated on quite a number and have learned a good deal from observing them. One of the things that I have learned is not to be in too big a hurry to jump at conclusions. We have been through a lot of waves of faddism in surgery. We are essentially faddists in a way. I will not enumerate them, but I cannot help but feel that we are in danger right now of taking up a new fad, namely, the indiscriminate resection of the gall-bladder. It is very much like the motto of the Irishman, "When you see a head, hit it." When you see a gall-bladder, take it out. It is quite probable that in times past we did not take out enough gall-bladders. I find myself taking

out more gall-bladders today than I did five years ago, but never without a good reason that I can demonstrate to any man from Missouri in the room. Cholecystectomy has a definite place in surgery. What are the indications for it? There is a difference of opinion. There are those in this hall who have very decided opinions on that subject, and I would like to hear from some of them.

Dr. Samuel J. Mixter, Boston.—It is a mighty good thing when you discuss a paper to have something to find fault with. The trouble with Dr. Deaver's paper is that it is so clear cut that you know right off whether there is anything to find fault with or not. I have found very few things to find fault with in his paper.

There are certain things that should not be overlooked in this discussion. Dr. Finney spoke of the mortality. That, I think, we can absolutely disregard. I do not believe that there is any more mortality in taking out the gall-bladder than there is in taking out the stone. In saying that, I am afraid I am criticising Dr. Finney's remarks more than I am discussing Dr. Deaver's paper. Dr. Finney said he could see no reason for taking out what is perhaps a normal gall-bladder. I think we should look at it the other way. Is there any good and just reason for leaving it? In early cases, where inflammation but no gall-stones are present, there can be no question as to what to do; but in those cases attended with complications and the presence of stones in the common duct, and so on, it may be a question whether to leave the gall-bladder or not. A gall-bladder with a few stones in it, with no adhesions, can be taken out easily. I see no reason for leaving such a gall-bladder. If you leave a gall-bladder in an exceptional case to drain the duct, or if a surgeon cannot find the common duct after he has taken out the gall-stones, that is the thing. That may apply to some surgeons, but it would not to Dr. Deaver or Dr. Finney.

There is one point as to the time of operation, and that is, in all late cases, where symptoms have existed for a long time, thorough search should be made of the common duct, the hepatic ducts, for small stones, and if they cannot be felt the duct should be opened. Often the occurrence of gall-stones is due to the fact that one formed in the gall-bladder has been taken out and stones are found later in the common duct. It is not a recurrence in the true sense of the word but the overlooking of gall-stones which are present.

In the cases with adhesions, with thickening, swelling about the duct, the common duct should be opened and thoroughly explored.

The question of pancreatitis comes in here, for it is often difficult to say whether we have pancreatitis or not. I cannot tell always from feeling the head of the pancreas whether it is normal or not. In certain cases you can tell, but in others you cannot.

I agree thoroughly with Dr. Deaver in the choice of operation in simple cases. Dr. Finney says he takes out more gall-bladders now than he did five years ago. I believe that is the experience of every surgeon. A few years ago in Rochester I know they were taking out very few gall-bladders; they were leaving them. Then they began to take out all pathological gall-bladders and the number of pathological gall-bladders has increased enormously.

Dr. Charles H. Mayo, Rochester, Minnesota.—What Dr. Deaver says about focal infections is very true. We know that the removal of the gall-bladder will cure certain types of infection, for example, typhoid and colon bacillus infection, which patients may have had for years. Probably the greatest advance made in medicine is the recognition of the fact that nearly all joint diseases, and especially most recurring local diseases, are due to some focus of infection that we carry with us. Such infection leads to wearing out of the heart muscle; to changes in the bloodvessels and finally to death; due to some minute focus located in another region. I have gradually changed my opinion in regard to removing the appendix on the slightest provocation; it is not good logic. There should be justifiable cause for its removal. It should not be taken out because it may sometimes be the focus of infection for other trouble, nor should our teeth be pulled out when we are young because they may later be the seat of an apical abscess. All children should not have their tonsils taken out because they may be the source of trouble later in life. I believe that diseased organs only should be removed.

Dr. Mixter has raised the question of how much good is the gall-bladder, and should it be preserved unless there is some vital reason for removing it. The gall-bladder is useful; it is capable of adding greatly to its size and to its rhythmical contraction, and it aids in maintaining the work of delivery of bile, which is intermittent like the flow of the ureters.

In operating we find that nature has eliminated the gall-bladder's function in many instances. In 86 per cent. of cases

of stone in the common duct the gall-bladder has become shrunken and diseased before the stone is forced through by contraction. Having gone through a change with the destruction of the mucosa, nature has eliminated it. There are only a few cases on record in which the gall-bladder has not been found in man, although a number of animals do not have them.

We know very little about the pancreas from the standpoint of diagnosis. It is a good thing to acquire a knowledge of its varying feel of density and size, and also of the spleen, for the good of both patient and doctor.

About 80 per cent. of the gall-bladder cases occur in women, and I think we are all agreed that the infection is hematogenous, that it comes from some focus, we do not as yet know what. When cultures are made from animal to animal, secondaries of gall-bladder disease run high if the start is made with bacteria that produce ulcer of the stomach. If the start is made from gall-bladder disease in man and a culture is injected into dogs and carried from dog to dog, the secondaries of pancreatic disease will run high. This is demonstrated clinically. Mucous warts in the gall-bladder, of which we have seen 137 cases, are due to bacteria. When they occur they doubtless have something to do with the development of a small percentage of the carcinomas of the gall-bladder. They are found when there are no stones, although the great majority of all carcinomas of the gall-bladder and primary cancers of the liver coming from them, come from gall-stones or apparently have developed around gall-stones, leaving diseased gall-bladders; a fact which is really up to the surgeon for serious consideration.

Dr. Finney is right in saying that badly diseased gall-bladders should come out, but in other cases how is one to tell whether the gall-bladder should come out or not?

About 25 per cent. of the patients with gall-bladder trouble that we operate on do not have gall-stones, but they have a serious cholecystitis. The condition may be papilloma, necrosis of the interior of the organ and various other changes, with foul-smelling bile and a lot of thick, mucoid material, but no stones. The remainder (75 per cent.) will have stones. Therefore in this class of cases we must recognize that cholecystitis probably in some degree precedes all gall-stone formation. With stagnation of bile, a gall-bladder with its walls full of bacteria fails to expand and contract during the period of inflammation.

In our hands cholecystostomy now has a much higher mor-

tality than cholecystectomy, as it was made in worse cases. Where there is a good lining to the gall-bladder, but little cholecystitis, just taking out the stones and draining will give a high percentage of cures. When we did nothing but drain such gall-bladders, we had 51, or 53 per cent. of cures. Then we began taking out gall-bladders because of the secondaries coming back to us; namely, mucoid cases, and the secondary development of stones and adhesions. In cases in which the gall-bladder was removed, not considering patients operated on within one year, 71 per cent. were cured. This operation will not cure all of them because many of these patients have secondary trouble which may come from the pancreas. The patient may have jaundice, and a lot of secondary troubles. The duodenum drains through a group of glands on the ducts; man has at least three, and no one has more than six. If the glands are examined when the hand is in the abdomen, a finger may be inserted into the foramen of Winslow and the ducts and glands palpated to determine whether or not they are normal. The gall-bladder should not be removed without proof of its condition; it would be a mistake to do so because the patient may not be cured and the real cause overlooked. If there is infection of the gall-bladder, one is usually justified in removing it; if it is diseased the glands will be swollen.

Dr. Le Grand Guerry, Columbia, South Carolina.—After hearing from so many big men in the profession, I think the question of what we are going to do with the gall-bladder should be discussed from the standpoint of the ordinary practitioner in the Association, because, I take it, we men of lesser experience have more trouble with this problem than men of riper experience and greater judgment.

Personally I feel this way, that it is as much a mistake to say that every gall-bladder should be removed as it is a mistake to say that no gall-bladder should be removed. If for no other reason, I always feel that it is an extreme position to take on this question, and that practically any extreme position is not a reasonably safe, conservative thing. As the members of this Association very well know, I have been much interested in this question for many years, and I have inflicted three papers on the Association along this line.

I have been particularly interested in that large group of cases of symptoms without gall-stones, and I have been able to collect a few statistics, not very many, that are representa-

tive. For instance, we know at the Massachusetts General Hospital during their entire experience in the cases of gall-stones without symptoms in which they have simply drained the gall-bladder, they failed to cure 33⅓ per cent. of the cases. A review of all gall-bladder cases operated on at the Johns Hopkins Hospital since the inauguration of that institution tells the same story. In about 25 or 30 per cent. of the total number of cases in which they drained the gall-bladder and found no stones, they failed to cure about 25 per cent.

Dr. Finney in a personal communication told me that in the same type of cases in his hands about 25 or 30 per cent. would be a conservative estimate to place on the number of cases in which he failed to give symptomatic relief. That is the first point I wish to bring out.

In 100 cases of gall-stones without symptoms, by the results we have been able to get at, 75 per cent. of them remained well, while 25 per cent. of them are not cured by the operation of cholecystostomy. It seems to me that it is not good reasoning and it is not good surgery to subject a number of patients to the operation of cholecystectomy when statistics show 75 per cent. of them are cured by the operation of drainage. The group we are most interested in, which gives bad results, still remains—25 per cent. of cases in which we failed to get a cure. What is best to do for those cases I am sure I do not know. I wish to make this confession: there is no more puzzling problem in the abdomen than to stand face to face with this issue because the aggregate of 25 per cent. all over the country means a big thing. If cholecystectomy will remove that 25 per cent. on the basis explained by Dr. Mayo, all right. I have had 16 or 17 cases in which I have done cholecystenterostomy, to side track bile around the head of the pancreas, by making an anastomosis between the fundus of the gall-bladder and duodenum. Some of these cases have been operated on several times by men much more prominent in this field of work than myself. Out of 17 cases we have had 15 that have remained permanently well; that is, they have gotten symptomatic relief from the trouble. There has been one death, and one patient failed to get relief.

This is a puzzle to me. On one occasion Dr. Maurice Richardson, of Boston, went to New Orleans to a meeting of the Southern Surgical Association and said he was glad to get to New Orleans because many of the cases of symptoms without

gall-stones in which he had removed the gall-bladder were coming back to him and he did not know what to do with them. I have had this concrete experience which I wish to lay before this body, as showing we should have a reasonable basis for removing the gall-bladder. I have had 5 patients return with a recurrence of symptoms after the gall-bladder had been removed. In the first two I attempted to do an anastomosis between the common duct and duodenum. I do not know how the rest of you feel about that particular operation, but certainly in my hands it comes very nearly being an impossible undertaking, especially if patients have been operated on two or three times. In two other cases I have anastomosed the choledochus to the duodenum with a symptomatic cure of the patient. In one other case I was not able to establish an anastomosis, and she has lived about five years since the operation with a permanent biliary fistula.

The recital of that experience to me means that it is a potent, just, and very fair reason why the indiscriminate removal of the gall-bladder ought not to be encouraged.

Dr. W. P. Carr, Washington, D. C.—Dr. Guerry's experience is very similar to my own. I had a number of patients like that very early in my experience with gall-bladder work, and I recognized the importance of having the gall-bladder in case I wanted to drain permanently into the duodenum. I have saved every gall-bladder that I could. I have never taken one out unless I thought it was malignant. I have never regretted having left the gall-bladder in, and in several cases I have been mighty glad I did leave it in. I have found it extremely difficult to determine whether there is an obstruction or not of the common duct, low down, and I have found it very difficult to tell whether there were any gall-stones in the lower end of the common duct, and in some cases where I found it certain there was obstruction low down in the common duct, I have been enabled to tell what was the cause of it. In one or two cases, where I had an enormously distended gall-bladder, and where the whole liver was enlarged by the backing of bile into it, and where on opening the gall-bladder I could see the liver shrink right up as the bile poured out, I was absolutely unable to tell what was the cause of the obstruction. I had four such cases one right after the other. I drained them all through the gall-bladder; two of them got well without any trouble. Two of them kept draining bile for months through this fistula. I did

a secondary operation on both of them, making a cholecystenterostomy, and they were cured. If I had no gall-bladder, I do not know what I could have done except leave a permanent biliary fistula.

I have seen many cases that I thought were chronic pancreatitis. I would like to ask Dr. Deaver and Dr. Mayo, who have had a large experience, in what percentage of their cases of cholecystitis and gall-stones they found pancreatitis? We had a discussion on that subject in a local medical society recently, and no seemed to know just what the percentage was, but 50 per cent. was suggested. In my cases about 30 per cent. had some enlargement or hardening about the head of the pancreas. I have thought that obstruction of the common duct sometimes comes from chronic pancreatitis and enlargement of the head of the pancreas where the duct passes through it. Drainage through the gall-bladder for a long time I have regarded as the best treatment for such cases.

I would like to say this: I have left about 20 of the worst-looking gall-bladders I ever saw and had no reason to regret it. Not malignant; but infected, half gangrenous. In the last case the gall-bladder was actually gangrenous in the upper half, which I cut off. I tied a drainage tube in the lower half, and the patient made a good recovery. He still has his gall-bladder, and if there is any need in the future I can use it.

My cases of recurrence of gall-stones must have gone to some other surgeon, as Dr. Hendon says they are apt to do; I have not had any of them come back to me.

I was glad to hear Dr. Finney say what he did about the difficulties in telling what to do in the upper abdomen because everything he said has come home to me, exactly picturing the situation I have been in myself in so many instances.

Dr. O. H. Elbrecht, St. Louis, Mo.—We are all seeking more light on the subject of recurrence of gall-stones or a recurrence of symptoms after cholecystectomy. The story just told by Dr. Carr about Dr. Finney is directly to the point and self-explanatory, but not incriminating. It reminded me of an experience in my work that made a deep impression and has made me recall it many times. A patient on whom I had done cholecystostomy a year or more before came to the hospital to be treated for some other trouble, and in giving her history stated that she had had a recurrence of gall-bladder symptoms. She died of a pulmonary disease and we were fortunate enough to obtain an autopsy. On removal of the liver the gall-bladder

and ducts were carefully examined and disclosed nothing unusual, but on sectioning the liver the first cross-section opened up several pockets or nests of gall-stones buried in the liver substances itself. On the discovery of this pathology the remainder of the ducts were cut open in line with their axis and showed a few single stones retained in the smaller ducts. These nests were contiguous to the liver ducts, having a direct communication varying in size and contained from two to ten small stones each.

This rare gall-stone picture furnishes much food for thought along the line of recurrence of gall stones, as in this case there has been a recurrence of symptoms after cholecystostomy and possibly some of the stones did find their way into the common duct and pass through. The deduction it suggests, however, is this: Does this condition in a more modified form occur often enough to deserve consideration as one of the causes of recurrence of gall-stone symptoms following cholecystectomy? I do not wish to be understood as offering this explanation to cover all cases of subsequent recurrence, but certainly many operators have seen cases where it was known to them at the time of operation that one or more stones escaped upward into the right or left bile duct and out of reach. It must therefore be borne in mind that all gall-stone surgery reaches only the lower half of the biliary ducts and for this reason has very definite limitations. It would also tend to show that gall-stone formation within the liver is the result of ascending infection, and that the drainage operations as practised at present offer little hope in effecting a cure in this particular type of cases. The case referred to by Dr. Carr in all probability was one of this type.

In closing let me remind you of a further suggestion that might prove of value in finding this kind of pathology more often. If all pathologists doing autopsies were instructed to trace down the larger bile ducts within the liver by cutting them open in line with their axis instead of multiple cross-section, as generally practised, it would surely disclose more information on this important subject. It would certainly insure more knowledge on the condition of the mucosa within the liver and give us some idea of the relative frequency of gall-stones found within the liver ducts.

Dr. Alexius McGlannan, Baltimore.—Recently there has been an attempt made to explain the frequent association of adiposity and gall-bladder disease on the ground that this

increase in fat accumulation is due to the effect of infection, of which the gall-bladder is a focus, acting on some of the glands of the endocrin system. If this be true, there is reason for the excision of the gall-bladder in these early cases in order that the endocrin glands may recover their balance, which they can only do after the infection is removed before the gland is entirely destroyed.

A second point which I have been interested in is the value of the transverse incision in reaching the gall-bladder and ducts. My experience has been small compared to that of other men, but most of the cases I have had to deal with have been late cases, with adhesions, and cases in which the operation was difficult. The transverse incision advised by Muscovitz has made the operation in my hands much easier than the longitudinal right rectus incision because of the comfort it affords in closing. At the end of a difficult operation deep in the abdomen, the closure is made much easier by folding together the abdominal wall, and it is very easy to suture the transverse wound after the operation is completed.

Dr. Hendon (closing on his part).—Inasmuch as Dr. Deaver's experience has been very large in gall-bladder surgery, I would like to ask him if in his experience he has noticed that a single large stone was generally connected with a short previous history of disturbance? That has occurred in the 2 cases that I have referred to.

I also want to ask him if there is any way by which we can determine gall-stones which have recurred since a previous operation. This is a matter of personal interest, I confess, on account of having found a stone two years after a previous operation, which was very soft and soapy in consistency, and I construed its consistency as meaning that it occurred since my operation. That thought was consoling to me, and I would like to know if I was correct.

Dr. Deaver (closing).—I am very much obliged to the members for this interesting discussion. It has been inspiring as well as instructive to me.

Dr. Finney has had an experience similar to mine as well as others, I dare say, regarding the difficulty of diagnosis of upper abdominal lesions. In the diagnosis I would emphasize the importance, first, of a history of the case; second, the *x*-ray, particularly if the proper man is behind the gun, and this is especially true in lesions of the stomach and duodenum, not so

much in connection with the gall-bladder, yet many of our *x*-ray men claim that they can find gall-stones in a very large percentage of cases. Pfahler, of Philadelphia, who is one of our best roentgenologists, claims that in about 50 per cent. of cases he can find gall-stones.

Dr. Finney reminds me very much of the late Dr. Maurice H. Richardson, our dear friend and colleague, who, whenever he spoke, always told the truth. Dr. Finney likes to relate his mishaps, and that is commendable in any man. Dr. Richardson did the same thing. In the American Surgical Association, whenever Dr. Richardson was to read a paper the members would say, Now we are going to hear the truth. It is always commendable.

Dr. Finney spoke of some cases that were not satisfactory after they left the operating table so far as the findings were concerned. Dr. Finney has said he handed these patients over to the medical man and trusted to luck. I think it is trusting to luck to refer these cases to the medical man; yet I have a high regard for the medical man when he confines himself to his proper sphere. My friend, Sam Mixter, gives the crux of the situation beautifully, and I believe with him and also with Dr. Mayo that the great majority of gall-bladders should be removed, and I believe the earlier they are removed the better will be our ultimate results without the shadow of a doubt.

A most important point in connection with the secondary conditions, as Dr. Mayo brought out, is the pancreas and particularly the pancreatic lymphatics. We are all familiar with Broedel's work in injections of the lymphatics. Dr. Pfeiffer, my assistant at the University, has corroborated this, and we have tried to complete it in our investigation in the living subject. We never do an upper abdominal case that we do not examine the pancreas throughout its entirety. We carefully scrutinize the head of the pancreas and the accessory glands along the common duct, usually three, never more than six, and particularly the gland at the junction of the first, the supraduodenal portion of the common duct and the duodenum. I examine carefully for enlarged glands, and if there are enlarged glands, and particularly the gland at the junction of the first and second portions of the common duct, I remove the gall-bladder, believing that it holds the same relation to the head of the pancreas and pancreatic lymph glands as a chancre holds to the inguinal system of glands.

Dr. Guerry spoke about cases of recurrence of gall-bladder disease symptoms after the removal of the gall-bladder in the absence of stones. I believe we would not have a recurrence of symptoms in these conditions if the gall-bladder is taken out early, and we will never get these cases early until the medical man and the gastro-enterologist bow at the feet of the surgeon. These men have got to come and partake of the waters. They will get salvation if they will only accept it. I have been trying for the last thirty years to make Christians of our doctors in the city of Philadelphia. I have succeeded to a degree, but I have not succeeded *in toto*. I hope to be able to do so in thirty years from now, and therefore there is some hope.

I cannot lay too much stress on what Dr. Mayo said relative to examination of the spleen as well as the pancreas. Many cases of ulcer of the fundus of the stomach, cases of incipient carcinoma, show usually a degenerative ulcer, and you will find perisplenic adhesions. I never do an upper abdominal operation that I do not pass my hand over and feel of the spleen to familiarize myself with the normal spleen, and in the second place to determine whether or not adhesions exist. They are the result of a pathological condition caused by infection, and you find them in connection with diseases of the fundus of the stomach, and diseases of the fundus of the stomach are not common. The majority of the diseases of the stomach are at the pyloric extremity.

Dr. Mayo brought out the question of focal infection, with which I agree. I am in the habit of laying great stress on the appendix because disease of that organ afflicts the human subject most often. I frequently have been called in consultation to see a case of jaundice and the medical man talked about acute yellow atrophy. He seems to evade the common causes of jaundice. I try to impress medical men and students that the appendix is the most important organ in the body, not that it is responsible for all infections, but for many of the upper abdominal conditions. In this connection I want to draw attention to Dr. Guerry's remarks relative to the 17 cases in which he did cholecystduodenostomy. I think that is a perfectly proper operation in many instances, but it requires more skill to do cholecystduodenostomy than to drain the gall-bladder. Therefore, as a rule, I try to shape my remarks to my audience. Of course, with this audience we can deal with things radically, but we cannot do it under ordinary circumstances. To have

standardized operations, a friend of mine has suggested that we must standardize the surgeons. Naturally, those of us who have examined the greatest number of cases and studied the pancreas and head of the pancreas, other things being equal, are better able to determine the best thing to do.

Medical men have been treating diabetes for centuries and they are no further along now than when they began. They hesitate to hand this disease over to the surgeon. They should hand cases of incipient infection of the biliary apparatus over to the surgeon earlier. We have cured diabetes by preventing it, by instituting early drainage, and prolonged drainage is essential. When I think of patients wearing T-tubes in the common duct for an indefinite length of time and remaining perfectly well, do you wonder that I make this statement. I have had one or two instances of patients who have preferred not to have these tubes taken out, fearing a recurrence. These cases occur more often in women than in men. The woman has a small pocket inside her corset in which she places the very small bottle into which drains the bile from the tube and in this way gets along comfortably.

I want to call attention particularly to pancreatic enlargement and the enlargement of the glands. I believe that carcinoma of the pancreas would be less frequent, to say nothing of carcinoma of the gall-bladder, if more attention were paid to that part of the subject.

Dr. Hendon has asked one or two questions that I cannot shed any light on. I am delighted with the discussion.

TREATMENT OF A DOUBLE FEMORAL ANEURYSM BY PROXIMAL OCCLUSION WITH AN AUTOPLASTIC FASCIAL FLAP

By Edward G. Jones, A.B., M.D.
Atlanta, Ga.

Aneurysms of the upper femoral offer peculiar problems for at least three reasons: (1) the many branches constitute a formidable handicap in any type of reconstructive operation; (2) obliteration of the vessel entails a material danger of gangrene; (3) when complete obliteration by ligature or otherwise is practised and gangrene is escaped some degree of functional disturbance in the leg is probable. The gloomy truth of the last-named fact is impressed on one by the exhaustive article of Dr. Halsted on ligation of the common iliac, which appeared in 1912.*

This report, however, is not concerned with the wisdom or unwisdom of proximal ligation for femoral aneurysms, but rather with the question how proximal ligation, when necessary or wise, may be done. We take it to be an accepted fact that the ideal closure above an aneurysm is that which nearly, but not entirely, occludes the lumen of the vessel.

If now one can almost occlude the vessel by some method which does not carry with it the danger of erosion and hemorrhage, such as the metal band entails, he will at

* Halsted, W. S.: The Effect of Ligation of the Common Iliac Artery on the Circulation and Function of the Lower Extremity, Bull. Johns Hopkins Hospital, xxiii, 191.

least have added to the safety of the procedure. Dr. Halsted has met the objection to the metal band by offering instead strips of fascia lata (autoplastic or heteroplastic) and sections of aorta (heteroplastic), and has been pleased with the results.* He is impressed with the belief that if the band does not permanently partly occlude the vessel the occlusion will last long enough to cure the aneurysm. Dr. Matas at the late meeting of the Southern Medical Association in Atlanta stated that he has been experimenting recently with bands of rubber tissue for partial occlusion of certain vessels. The results of this addition to his already well-known work of this sort will be awaited with interest. When the occlusion may be accomplished by autoplastic tissue this would seem preferable to any other material. If, furthermore, the site of the proposed occlusion is such as to allow an adequate constricting band to remain attached at one end the possibility that the band will become permanently grafted upon the vessel, or at least last longer than a similar detached piece of tissue, will certainly be increased and the probability of cure of the aneurysm correspondingly enhanced. The ilio-femoral is favorably located in respect to the above conditions.

We present the following case as illustrative of what is possible in dealing with some aneurysms of this vessel, and as suggestive of what occasionally may be accomplished elsewhere in the body.

W. C., colored, laborer, aged forty-eight years, admitted to the surgical service of Grady Hospital September 27, 1914.

Family History. Uncertain.

Present History. Some two months ago noticed swelling in his right thigh a short distance below the groin. Some little aching in the neighborhood of the swelling and numb-

* Halsted, W. S.: Annals of Surgery, lviii, 2.

ness lower down the thigh. Patient frequently puts his hand on the swelling and notices throbbing.

Physical Examination. Fairly well nourished, of good muscular development. On admission temperature was 98°, pulse 84. Temporal and radial vessels sclerosed. Posterior cervical, epitrochlear, and inguinal lymphatics enlarged. Pupils equal; react to light and accommodation. Teeth in poor condition, odor of pyorrhea. Lungs normal to percussion and auscultation. Heart normal, apex in 5th i. s. The abdomen presents no peculiarities. Over the patient's back, and to a less extent elsewhere, the skin shows eruption characteristic of syphilis.

Beginning 6 cm. below Poupart's ligament on the right, in the course of the femoral artery, there is a rounded pulsating expansile enlargement. It has a diameter of 5 cm. Five cm. below the lowest margin of the enlargement just mentioned there is, in the line of the artery, an enlargement 3 cm. in diameter, exhibiting expansile pulsation. Compression of the artery above stops pulsation and lessens size of swelling.

Treatment and Progress. Antisyphilitic treatment was kept up for three weeks before operation.

Oct. 31. A curved incision 10 cm. long, convexity downward, uncovered the beginning of the right femoral artery, Poupart's ligament, and the lower external oblique aponeurosis for a little distance upward. Several inguinal glands were removed to clear the field. A flap of aponeurotic membrane 1 cm. wide and 7½ cm. long (largely Poupart's ligament), immediately overlying the artery, was dissected up, being left attached at its outer extremity. It was wound once around the artery and stitched back in place with just enough tension to obliterate pulsation in the vessel and in the aneurysms below. No. 1 chromic gut was used. The superficial epigastric was tied and cut. Bruising of the artery was carefully avoided. The over-

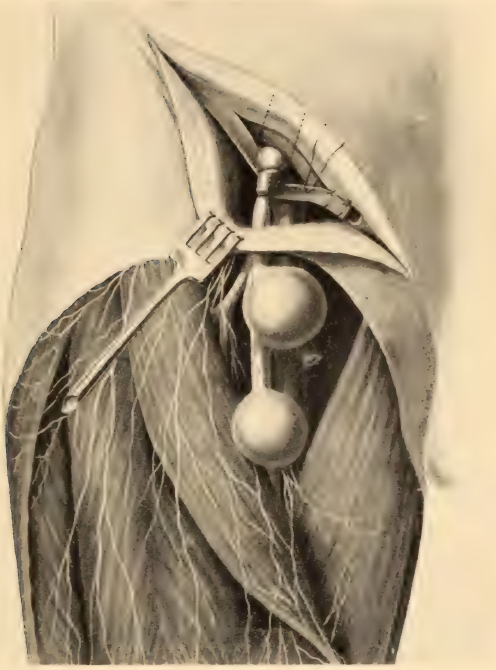

FIG. 1.—Drawing showing partial occlusion of primitive femoral artery with band of fascia from Poupart's ligament.

FIG. 2 FIG. 3 FIG. 4 FIG. 5

FIG. 2.—Showing occluded vessel before and after lumen had been opened.

FIG. 3.—Also showing vessel before and after lumen had been opened. Complete occlusion.

FIG. 4.—Apparent partial occlusion fourteen weeks after application of band.

FIG. 5.—External appearance of occluding band fourteen weeks after application.

lying skin flap was stitched back in place. Right leg ordered kept warm with hot-water bottles.

Nov. 2. No discomfort in leg. Seems to be of the same temperature as the opposite leg. Aneurysmal sacs are easily felt, but exhibit no pulsation.

Nov. 5. Aneurysmal sacs about the same size as immediately after operation; no pulsation.

Nov. 12. Patient up. No apparent disturbance of function in leg. Aneurysmal sac decidedly smaller; no pulsation.

Jan. 5. Patient returned to hospital with small skin sinus in operative wound. Knot of catgut removed. Swelling representing aneurysms can barely be palpated. Leg in good condition. Antisyphilitic treatment has been continued.

June 12. No sign of aneurysms. Some pulsation in Scarpa's triangle, but area is quite smooth. No trouble in use of leg, but some numbness in calf most of the time.

Dec. 2. Function good. Patient says there is some numbness and occasional aching in calf of leg, but he works every day. Normal pulsation in groin to a point slightly below Poupart's ligament. Beginning 5 cm. below this latter point diminished pulsation in femoral line can be felt, and followed further down the thigh, but there is no evidence of either aneurysm.

The procedure outlined pulls the artery somewhat sharply forward out of its course. While we did not think erosion and hemorrhage would occur, we recognized it as a possibility.

We also needed to know whether the vessel could be kept closed, or approximately closed, for such a length of time as would reasonably guarantee the cure of an aneurysm.

We furthermore needed information as to whether such

an approximate closure would frequently endanger the limb or seriously impair its function.

So far as the foregoing questions may be cleared up by using dogs for comparison we were able to get uniformly satisfactory answers.

1. We have occluded the femoral immediately below Poupart's ligament by a band of fascia as above described twenty-four times in fifteen dogs. The dogs have been kept alive from two to eighteen weeks, and in no instance has there been hemorrhage. Furthermore, nearly all of these vessels have been examined at varying periods after occlusion, and it was evident that in no case was there danger of subsequent erosion.

2. Most of these vessels have been examined at periods varying from four to sixteen weeks after being occluded to determine if the occlusion were still present. Without exception there has been a very much smaller artery below the constriction than in the other thigh used for comparison.

With great uniformity when the vessel has been uncovered above and below the constriction there has been the full pulsating external iliac apparently stopping flush with the occlusion, and below the band a cord which pulsated feebly or not at all until a point was reached corresponding to the giving off of the deep femoral.

3. It may be questioned very properly whether partial or total occlusion of the femoral in a dog jeopardizes the limb so much as a like procedure in man. Nevertheless, we submit the information that in none of these twenty-four instances was there evidence of gangrene. We know that in quite a percentage of these dogs the vessel was entirely occluded (see illustrations), whether immediately or gradually we do not know. Following the operation our notes show that the pulse could be palpated somewhere in the leg on an average on the tenth day. The earliest pal-

pable pulse is recorded on the sixth day and the latest on the twenty-fourth day.

All the dogs were kept alive long enough for observation on loss of function. The average dog was lame for five to six days, but it is doubtful if this was anything more than soreness from the wound. A few were more or less lame for two to three weeks, but none of these failed to recover apparent normal use of the leg.

We are not entirely convinced whether or not the bands when applied so as to still allow the passage of a small current of blood will cause a permanent closure of the vessel. In the first place in experimenting with small dogs it is difficult for one to know with precision if he has or has not drawn the fascia to just the exact tension which will produce this result; in the second place a certain degree of relaxation probably always occurs. We know (see illustrations) that the band drawn snugly around the vessel effects a permanent closure either gradually or immediately, but we do not know beyond any doubt whatever that, through error, the band was not drawn too tight when it was applied.

During the earlier of these experiments we were more concerned with the problems of hemorrhage from erosion and whether the band would constrict the vessel long enough than with the question of whether a band so applied would permanently occlude the vessel. We believe that permanent closure follows the application of the partly occluding band; but the number of our experiments and the attention we have given this feature do not at present justify the statement without qualification. We believe that in the vessels shown in the lantern slides the closure was gradual. One photograph shows a vessel which was removed fourteen weeks after application of the band. There seems to be a small lumen at and below the constric-

tion, but the microscope shows that intimal proliferation is filling up the vessel.

Histological examination of sections cut through the point of constriction shows the vessel wall embraced by fibrous tissue, which seems to be the fibrous tissue of Poupart's ligament itself. There would seem to be no reason to assume that it is a substitution for the band rather than the band itself. Indeed, macroscopically there is every evidence that the original tissue is in place. The band can practically always be traced outward from the vessel to blend with the aponeurosis; it cannot be identified and traced so uniformly to its inner attachment.

SOME POINTS IN SURGERY OF THE EXTERNAL CAROTID ARTERY

By William Perrin Nicolson, M.D., F.A.C.S.
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A glance at the literature of surgery would reveal the fact that while ligation of the larger vessels has been somewhat fully described, there is little in reference to the external carotid, and the writer has felt that a somewhat extended experience with operations upon this vessel might be presented with some interest and profit.

When we consider the anatomical arrangement of the vessels of the neck, and study their distribution, we can but reach the conclusion that Nature has so arranged the circulation as to extend to us an invitation to utilize this most valuable means of producing a temporary ischemia in operations involving this region. The subclavian, having supplied the lower portion of the neck, the common carotid, by dividing, leaves to the external the distribution of the supply to the extracranial structures, while the internal carotid passes without giving off a branch to enter the skull for the intracranial blood supply. The only exception is the middle meningeal, which enters the skull from the external carotid. For many years ligation of this vessel could not be considered, because when the ligature came away, there had not been space enough between the branches for a thrombus to form, and secondary hemorrhage was almost a certainty. Hence the surgery of this vessel became possible with the ligature that remains *in situ*.

May 21, 1891, the writer, then in his early surgical work, was called upon to remove his first upper jaw, and the current descriptions gave a gloomy picture of hemorrhage, shock, and death. The idea at this time occurred that a preliminary ligation of the external carotid might check hemorrhage and simplify the operation. The patient was in the country, and could not be removed to the city because her baby was only eight days old, and the sarcomatous tumor was growing with great rapidity. She was removed from her bed to the operating table. After some difficulty, due to natural timidity, the vessel was tied with No. 2 catgut ligature and the wound closed. The first incision into the face bled so freely that it appeared as if some mistake had occurred, but this soon ceased and the jaw was removed successfully without tying another artery. This case was published in the *Atlanta Medical and Surgical Journal*, and afterward abstracted by Dr. Matas in Davis's *Medical Annual*, and from this starting point, as far as I know, began the deliberate ligation of this vessel for the purpose of preventing and controlling hemorrhage. Since that time a large experience has forced upon me the conviction that this subject has not been appreciated by the surgical profession.

It is a notable fact that all operations upon the head and face are by force of circumstances bloody, and when the operation involves an opening into the mouth we have the added danger of blood finding its way into the air passages, and we even find at this day recommendations of a preliminary tracheotomy and pharyngeal plugging. Ligation of the external carotid absolutely controls all serious hemorrhage, shortens the operation, prevents shock, and places the operation upon a plane within the reach of any surgeon.

The first question that naturally arises is that of the danger incident to the operation, and so far, in my experi-

ence, I can pronounce it nil. I have tied the artery well over one hundred times. Four times both external carotids had been tied at the same operation; twice a common carotid at one side and external upon the other; eight Dawbarn resections of the entire external carotid upon both sides, with an interval of a week between; eighty-two single ligations for the purpose of controlling hemorrhage, and in no case has there been a death, and this should establish the fact that the operation is safe. When the writer, in a discussion of the Crile operation of carotid compression, advanced the idea that this is safer in the average hands, Dr. Crile said in reply that he believed the mortality of external carotid ligation would be as much as 2 per cent. from embolism, and since that time the text-books have it that "Crile says the mortality of external carotid ligation is 2 per cent.," which shows the weight of the thoughts of a great man.

It is my purpose to mention some of the conditions in which it has been clinically exceedingly useful to me. In the first place, in any operation about the face or neck in which hemorrhage may become a serious factor it wonderfully simplifies the work. It does not prevent bleeding but makes it controllable without ligature and its cessation spontaneous. Perhaps its most conspicuous good is as the preliminary step in the removal of the upper and lower jaws. It should be always done under the same anesthesia, and not a few days beforehand as has been recommended by some. In these cases, though hemorrhage is often very free for a short time, no ligature is required, even for the temporal or internal maxillary, and it tears from the removal of the jaws the veil of all its terrors, and makes it an operation practically free from difficulty and danger. In thirty-seven resections of the upper and lower jaws only thirty-seven vessels have been ligated. In removal of the Gasserian ganglion it has been pronounced by many as

unnecessary and not helpful, and to this I most respectfully disagree. There are two factors in this operation fraught with serious hemorrhage, the scalp and the middle meningeal. Writers speak of the ease with which hemorrhage from a torn meningeal can be controlled by ligation or pressure, but tying the external carotid has been in my hands easier than the meningeal. An eminent author, in his text-book, advises that if the middle meningeal is accidentally injured, and cannot be tied, the skull should be "packed and the operation resumed two days later." In a case in which this occurred in my own work, after trying in vain to control the artery, we tied the external carotid in five minutes, the hemorrhage ceased, and the operation was completed without further difficulty. The carotid ligation before the ganglion operation disposes effectually of the meningeal as a cause of worry and danger. In removal of the fibrous tumors in the back of the throat by throat surgeons, in which hemorrhage is such a serious factor, I have done the ligation for them, and the tumors have been removed without difficulty and with little hemorrhage. In removal of the tongue and floor of the mouth it is exceedingly useful, making the balance of the operation simply one of trimming away the growth, and it is a simpler operation than ligation of the lingual. Removal of the lower lip for cancer I have found exceedingly useful, and it in no way interferes with primary union afterward. An interesting case in my experience was a young lady who had been bleeding for a week from the extraction of a lower molar tooth until exsanguinated, in spite of all efforts, by various means, to control the hemorrhage, the external carotid was tied in a little more than ten minutes, with immediate control of the hemorrhage and a speedy recovery.

In regard to the technic of this operation one has only to follow the description in the text-books to be convinced

that they are based upon the work upon the dissecting table. There seems to be a healthy respect among most surgeons for the carotid triangle, but its anatomy is well defined and very fairly constant. The anatomical relations, from a surgical standpoint, while important, are easily handled. The bifurcation of the common carotid, in a large majority of cases, is opposite the upper border of the thyroid cartilage and not at the hyoid bone, and in a series of operations in my hands has never been below that point. In many cases it is much above that landmark, even extending up under the angle of the jaw, and in one case in which it was normal on the right side it was in the edge of the parotid gland on the left. In two cases no bifurcation was found, and in these the common carotid was tied. The relation of the carotids to each other is pretty constant, it being always remembered that the external carotid is nearest to the medium line. In three cases I have seen the vessels lying upon the top of each other, and in all of these the external was the most superficial. The relation of the internal jugular vein is quite variable, in some cases overlapping the vessel on the outer side, and requiring retraction during the ligation; but in very many cases it is not a relation that is seen. Perhaps the most embarrassing relation is the combined trunk of the facial and lingual veins crossing at right angles, and in many instances a very large vessel. The hypoglossal nerve is not a relation at the point where I ligate. Anatomically the external carotid is a superficial vessel, and in thin necks it actually is so, but it is very deep in thick, short necks.

I know of no description of this operation that goes much into details that can help one seeking guidance. The skin incision is usually advised as four inches in length, but an opening of from one to one and a half inches, with its center opposite the upper border of the thyroid cartilage, is usually ample. This should go through the skin and

platysma muscle. After the deep fascia has been opened I know of no operation in which the finger is more useful. With the index finger the way can be rapidly torn down to the vessel without damaging any of the structure. We are often told that the guide to the vessel is feeling the pulsation with the finger, but the rapid breathing of the patient makes this very unreliable. It is a useful thing to remember that the common carotid always has a bulbous swelling just as it bifurcates, and this I have found a valuable guide. The vessel is recognized by its yellowish-white color. I do not find any distinct sheath at this point, though we are told to pick it up and open it. My rule is to pick my way down to the bare artery with a tissue forceps and the point of the finger. Should the trunk of the lingual and facial vein cover it extensively it can be pulled out of the way with a hook or can be cut between forceps, and it should be tied at once. In a case in which the forceps were left on, in the haste due to a sudden hemorrhage at another point, the forceps were taken off, and when the ligation had been completed and we were looking into a dry wound there was a sudden and horrible gush of blood, which at first was inexplicable, but it turned out that the compressed end of the vein had opened up. It caused quite a panic for a while. I take issue with what is usually described as the point of election, namely, between the facial and lingual branches. The point of election with me is the immediate crotch of the vessel, for thus nowhere is left for a thrombus to form. I have never seen any allusion to the anatomy or surgery of this vessel to the dense connective tissue, the remains of the carotid gland, which binds the trunks together. At this point the space between the vessels is simply an indistinct groove. The aneurysm needle is passed from within outward, and when it comes against this tissue it appears as if it is coming directly through the walls of the artery. I rub the point through

with the finger or some instrument and thread it and withdraw the ligature with it. This seems to work more satisfactorily than when it is threaded beforehand. A practical point of extreme value is to have the anesthetist place his finger upon the temporal artery, and the operator either cross or pull upon the ligature and see that it stops the circulation in the temporal. I know this is important, because once when I did not take this precaution I tied the internal by mistake. Fortunately we were able, with sharp-pointed scissors, to cut the ligature and release it without any damage to the vessel. This ligation should not be done with a grunt and a jerk, because Ballance and Edmonds, many years ago, demonstrated that a pressure of three pounds was sufficient to close the common carotid. Just enough force should be used to stop the circulation and bring the inner walls of the vessel together. I always employ a double strand Ballance knot with No. 00 or No. 0 forty-day chromic catgut. Larger sizes of catgut are entirely unnecessary, and I believe sometimes harmful. All clamped vessels are now tied with fine catgut and the skin closed with 00 chromic catgut without drainage. In many cases the operation can be completed in a few minutes, and the ultimate shortening of the entire operation is so great that these few minutes are well spent. Dawdarn, in his prize essay, demonstrated that there were seventeen different routes by which the anastomotic circulation takes place, so that in a few days pulsation returns in the trunk of the temporal artery.

The statement I have made, that in average hands this is a simpler procedure than Crile's compression of the common carotid, is based upon the fact that it controls the same area of arterial distribution, and I believe carries less risk than cutting off the circulation from the brain, even though this does not last longer than a few hours. An ischemia of the brain for this length of time may be accom-

panied, I should believe, by some danger of change in the brain cells. In conclusion it is again presented that this operation of closing the external carotid carries with it valuable features that have been overlooked, and must some day be fully recognized. To those who desire to simplify surgery of the face and head it is a consummation devoutly to be wished.

TRAUMATIC ANEURYSM OF THE TEMPORAL ARTERY

By J. Shelton Horsley, M.D.
Richmond, Va.

A traumatic aneurysm, according to Matas, is an aneurysm that results from a trauma to a healthy artery. It is not very common and should not be confused with the so-called idiopathic type of aneurysms that occur in diseased arteries. Sometimes in the idiopathic type there is a history of a slight trauma or strain which preceded the formation of the aneurysm. However, such an injury, which would be insufficient to damage a healthy bloodvessel but will produce an aneurysm in a diseased artery, is not the chief etiological factor. It is only when traumatism is the sole cause, and when the bloodvessel was healthy up to the time of the damage that the resulting aneurysm can be termed traumatic. Instances can be imagined in which injury to a healthy artery may produce a weakening of some of the coats of the vessel and cause a pouch formation somewhat similar to the protrusion of an inner tube when the outer tire has given away; but, as a matter of fact, probably all traumatic aneurysms are caused by a direct arterial injury that results in a hematoma. A true traumatic aneurysm, then, may be described as one that results from the organization of a hematoma produced by an injury to the wall of a healthy artery.

What probably takes place is that the trauma produces a rupture of the artery, and an extensive hematoma is formed

which, by its pressure, prevents further bleeding, but the force of the arterial stream produces a pocket or lake in that portion of the hematoma nearest the injured artery. This lake becomes lined with endothelium, and later a supporting framework of connective tissue, corresponding to the adventitia of the bloodvessel, is gradually formed while the rest of the hematoma is being absorbed. In most instances in which a healthy artery is ruptured the patient either bleeds to death or the artery is occluded by a thrombus from the pressure of the hematoma. It is the exceptional case in which one of these things does not occur, and here, unless an injury to a vein causes a communication with the vein, a traumatic aneurysm forms. We can merely speculate why it occurs at all. In dogs where clotting of blood is very prompt it is practically impossible to produce a traumatic aneurysm. In man several conditions may promote it; the injury to the artery may be done in such a manner that a flap of intima is formed; a hematoma may occur in such a way as to produce a mechanical effect on the blood stream that is most likely to cause an eddy; or there may be a deficiency in the elements of the blood or tissues that produce prompt clotting. The rarity of these conditions evidently accounts for the uncommon appearance of traumatic aneurysms even in exposed vessels.

The temporal artery, or, as it is called by Gray, Piersol and others, the superficial temporal artery, is one of the two terminal branches of the external carotid, and though smaller than the internal maxillary, the other terminal branch, its course is practically a continuation of the external carotid; consequently, it receives the full force of the direct current. The temporal artery begins in the substance of the parotid gland behind the neck of the condyle of the lower jaw, crosses over the root of the zygoma lying on the temporal fascia, and divides about two inches above the zygoma into an anterior and a posterior temporal

branch. It gives several branches from its main body, twigs to muscles and to the parotid gland, the transverse facial, middle temporal, orbital, and anterior auricular. The anterior temporal runs tortuously upward and forward on the forehead. The posterior temporal, which is somewhat larger, curves backward and upward along the side of the head. The temporal artery itself and its terminal branch, the anterior temporal, are very superficial and are much exposed to trauma. The posterior branch is usually protected by the hair and a hat or cap. The temporal artery and its continuation, the anterior temporal, lie close to the skull and rest on the temporal fascia and pericranium of the skull throughout most of its course. A blow upon either of these arteries would drive it against the skull, with but little protection of soft tissue either over the artery or under it. It seems remarkable that serious injuries to these temporal vessels are not more frequent, especially in children and athletes, in whom bumps and blows on the head are such common occurrences.

Since 1896 a rather thorough search of the literature has shown only 5 cases of traumatic aneurysm of the temporal artery and its branches. A brief abstract of these follows:

O. Manz [1] records the case of a sailor, aged twenty-five years, who received a blow from the fist on the right temporal region, and two years later examination showed a small globular tumor under the skin. The tumor had developed during the past two years and had attained the size of a hazelnut. It pulsated distinctly. It involved the bifurcation and upper end of the right temporal artery. The sac was excised after ligating the arteries on each side of the aneurysm.

George H. Edington [2] reports the case of a boy, aged fourteen years, who was wounded in the right temple by the bursting of a soda-water syphon. There was a small

punctured wound which bled profusely. One stitch was taken to stop the bleeding. Several days later a pulsating swelling appeared where the temporal artery crossed the right zygoma. It was spherical, about three-quarters of an inch in diameter, and presented expansile pulsation. On the apex of the swelling there was a small wound almost healed with a stitch in it. The aneurysm was operated upon, the artery being ligated above and below the sac, and the sac excised. It contained a dark clot which on removal left a smooth interior of the sac that communicated with the temporal artery by a small aperture.

H. Morestin [3] reports a traumatic aneurysm of the temporal artery in a patient, aged forty years, who was injured in the right temporal region as a result of an automobile accident. The bleeding was arrested by compression and dressing. Several days later a small round mass formed under the scar and gradually increased in size. The skin appeared normal and could be moved over the growth, which was about the size of a large pea. There was distinct pulsation, synchronous with the radial artery. The aneurysmal sac was excised after ligating the artery on both sides of it. The sac when removed had a cavity, with uniformly thickened walls, into which the ends of the artery opened. It involved the frontal or anterior temporal branch of the temporal artery. According to Morestin, aneurysms of the small superficial arteries of the head are very rare.

E. Holzwarth [4] records the case of an officer who, in August, 1914, received a gunshot wound. The projectile penetrated the middle portion of the left zygomatic arch, the point of exit being on a level with the auditory canal behind the ear. He lost much blood and a large hematoma formed in front of the ear, which evacuated itself a few weeks later through the external auditory canal. Since then he noticed constant blowing sounds, which increased

FIG. 1.—Drawing showing the location and appearance of traumatic aneurysm in Case I. The aneurysm involves the first part of the anterior temporal artery.

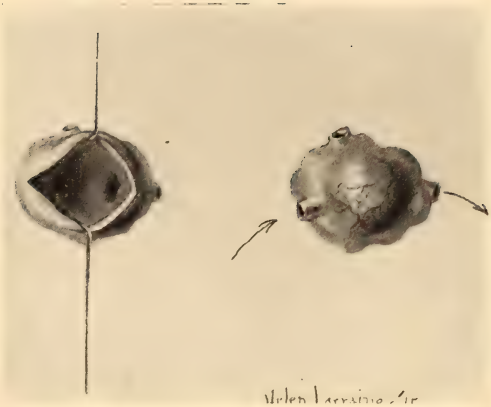

FIG. 2.—The sac of the aneurysm in Fig. 1, after its removal.

FIG. 3.—Case II, showing the traumatic aneurysm of the temporal artery.

FIG. 4.—The sac of the traumatic aneurysm in Fig. 3 after removal.

on exertion. Three months ago there was marked dilatation of the temporal artery and its branches. The temporal artery was dilated cylindrically in front of the ear. There was pulsation and a blowing bruit. The upward branches were also dilated. Holzwarth demonstrated the case as one of unusual rarity, a case of aneurysm of the temporal artery from a gunshot wound.

At the same meeting Dr. Theodore Hülti presented a patient who had six weeks previously sustained a contusion of the head from a fall. Five centimeters from the outer angle of the eye there developed an increasing tumor, with fluctuation and pulsation.

The following two cases of traumatic aneurysm in the temporal arteries which have occurred in my practice were both in youths whose previous health had been good and in whom there was no history of either acquired or hereditary syphilis. As the aneurysms in both cases followed severe traumatism, which at once produced large hematomas, they may be taken as examples of traumatic aneurysms in previously healthy arteries.

Case I.—H. G. P., aged nineteen years; white; male.

Family history has no significance.

The patient has had the usual diseases of childhood, also pneumonia and typhoid fever. He was well nourished and in good, general health. He had never had any venereal disease, and there was no history of hereditary syphilis.

While playing basket-ball in November, 1914, he was struck in the right temporal region. This was followed by very marked swelling which gradually disappeared. The skin was not broken. A few weeks later a small circumscribed growth, about the size of a buckshot, appeared on the right side of the forehead, about two inches above the zygoma. Pulsation in the growth was soon observed. It gradually grew until it became about one-half an inch in diameter. Since May 1, 1915, the pulsation has been

more marked. Operation was done June 12, 1915. An incision was made under novocain and the sac dissected out. The artery was ligated above and below the aneurysm and the aneurysmal sac excised. It seemed to be in the first portion of the anterior temporal. The patient left the hospital two days after operation. There has been no recurrence.

Case II.—E. M., age nine years; white; male.

There was no history of syphilis in either parent. There were two children, both healthy. There was no history of miscarriages in the mother.

The boy has had the diseases peculiar to childhood. He was operated upon for adenoids four years ago. In March, 1916, while wrestling, he was struck on the left side of the head by a boy's shoe heel. Considerable swelling followed, which gradually disappeared, and a small lump formed just above the zygoma on the left side. No pulsation was felt in this lump until May, 1916. After this time the growth, which was about one-half an inch in diameter, began to pulsate. On exertion the pulsation became so marked that it was disagreeable to the patient. Operation was done under local anesthetic on May 26, 1916. A transverse incision was made and the aneurysmal sac was excised after ligating the temporal artery below and above the sac. There were three arterial branches from the sac. The sac sprang from the temporal artery just above the zygoma. It contained a small clot, which was partly adherent to the interior of sac. The patient left the hospital the following day, May 27, 1916, and made a satisfactory recovery. There has been no recurrence.

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CANCER OF MAMMARY TISSUE MISPLACED IN AXILLA

By J. Shelton Horsley, M.D.
Richmond, Va.

Tumors of the axilla are usually metastatic, as it is the junction point for lymphatics that drain the upper extremity with those that drain the mammary gland and the adjacent pectoral region. Growths in the axilla first call for a thorough inspection of all these regions. Sometimes metastases occur here in a retrograde manner from the neck. Usually the source of the trouble is found, but primary tumors in the axilla, while not common, are occasionally seen. The most frequent source of primary tumors in the axilla are dermoids or misplaced mammary tissue. The latter probably occurs in the atavistic form of reversion to the type of animal in which there are several mammary glands on each side.

The possibility of cancer occurring in misplaced mammary gland tissue must be borne in mind. The number of cases in literature is not large, so a report of this case may be of interest.

Miss H. T. S., white, single, American, aged forty-six years.

Family History. Mother died from some liver trouble and father died of old age. The patient has two brothers living and in good health. One sister died at the age of twenty, there being no definite diagnosis; one died at the age of fifty-three with cancer of the uterus, and a third is

now dying of cancer. There are three other sisters living and in good health.

The patient was referred by her family physician. She had a growth in the right axilla. The probable diagnosis seemed to be tuberculous adenitis. Examination showed no lesion of the breast or upper extremity or elsewhere in her body. She had noticed the growth since February, 1913, and it caused considerable pain, which radiated to the shoulder and elbow. The pain appeared to be worse every three or four weeks, which probably coincided with her menstrual periods. The patient was quite nervous.

The arm gradually became more painful. Operation was done July 16, 1913, under ether. A curved incision was made below the area so as to avoid cutting through the skin of the axilla. A block dissection was made. There appeared to be several lumps which were taken for glands. A piece of rubber tubing was inserted for drainage.

The patient made a satisfactory recovery and left the hospital July 21, 1913, five days after operation. She has had no trouble since, except that she complains of occasional tingling sensation about the arm. This may be due to the section of the intercostohumeral nerve in the dissection of the axilla. I examined her November 26, 1916, and found no evidence of recurrence. Dr. Joseph C. Bloodgood made a microscopic examination of the specimen and reports that it is undoubtedly cancerous, and that it evidently springs from mammary gland tissue.

Aside from the pathological feature there is a clinical symptom of some interest. Cancer, especially of mammary tissue, is almost always free from pain in the early stages. The fact that pain occurred so early and was quite annoying may be attributed to early pressure on the sensory nerves in the axilla, especially on the intercostohumeral nerve, in a patient who is quite nervous and susceptible to pain.

DISCUSSION OF THE PAPERS OF DRS. JONES, NICOLSON AND HORSLEY

Dr. James M. Mason, Birmingham, Ala.—I do not think misplaced mammary tissue is infrequent, though I have not observed any case where such tissue had undergone malignant change. Three cases of misplaced mammary tissue have come under observation, and in no case did the patient know of the existence of the tissue until after pregnancy had taken place. For the first few days after the establishment of lactation the swollen mammary tissue caused great pain and inconvenience. This gradually subsided except in one case, and in this case I was compelled to remove the masses from each axilla.

In the other two cases, I have considered the advisability of removing the tissue to guard against the possibility of the development of malignancy, but as both patients are healthy and are having no present trouble, nothing has been done.

I should like to get Dr. Horsley's opinion as to the advisability of removing such masses when they are known to exist.

Dr. James E. Thompson, Galveston, Texas.—I wish to say a word or two about Dr. Horsley's case and point out that misplaced mammary tissue is quite a common condition. Very commonly we find it in the axilla. Occasionally quite a considerable amount of mammary tissue is present over the lower portion of the serratus anterior muscle. Pathologically, abscess formation is common and malignant disease far from uncommon.

As regards pathological infections of the axillary lymphatic nodes, we should not always rush to the conclusion that enlarged glands in the axilla are dependent on the same pathological condition which may be present in the breast at the same time. The following is a case in point:

A few months ago I removed a breast which I thought was infected with a diffuse scirrhus growth. In removing the glands from the axilla I found, to my surprise, that the axillary glands in the immediate neighborhood of the breast were not enlarged and were very hard to find. The higher up in the axilla one progressed, the more infected the glands became. In the upper part of the axillary space I removed three large glands surrounding the upper end of the axillary vein like a collar. The matter slipped my mind until my attention was called by my path-

ologist to the peculiarities of the specimen. The breast was diagnosed as an inflammatory growth and not malignant. The enlarged glands were found to be infiltrated with epithelial elements entirely unlike anything that occurred in the breast. They reminded one more of metastases occurring in cancer of the stomach or cancer of the gall-bladder. If anything, they were more like secondary deposits met with in cancer of the gall-bladder. Further examination of the patient elicited the fact that she had suffered from numerous attacks suggestive of gall-stones. For a number of months she had been losing flesh and had been complaining of a good deal of pain in the epigastrium and gall-bladder region. She was enormously fat and a physical examination of any value was an impossibility. It is very probable that this patient was suffering from malignant disease of the gall-bladder and that the axillary glands were infected with this condition just as cancer of the prostate will often cause widespread metastases in the glands of the neck. It teaches us the important lesson that we should have a careful examination made of very pathological specimen and not to accept conditions on their face value.

Dr. J. Garland Sherrill, Louisville, Kentucky.—As mentioned by Dr. Horsley and several of the speakers, misplaced mammary tissue is not infrequent, but carcinoma in displaced mammary tissue is infrequent.

I wish to add one instance to the collection of cases of misplaced mammary tissue, occurring over the pectoral muscle an inch and a half below the clavicle, a carcinomatous development away from the gland and without involvement of the gland itself. This case was unique in my experience and should be placed on record.

Dr. V. P. Blair, St. Louis, Missouri.—In a routine examination of a woman, forty-three years of age, which I made two and a half years ago, I found a small tumor in the axilla attached to the skin. I thought it was a fibroma. It had been there three years without giving much trouble of any kind. Last February which was a little over a year after I first examined her, she returned with evidences of growth in this region, and it turned out to be scirrhus which was attached to the breast.

Dr. Edward P. Richardson, Boston.—I have seen one case of aneurysm of the temporal artery which occurred in a young man who had been working with a heavy hammer in striking, and a very small piece of steel struck him over the anterior

branch of the temporal artery. He was seen eight months later with a small swelling above and external to the eye. This case had been diagnosed as a congenital epidermoid cyst. The point I would make is that the pulsation in a small tumor of that sort may be overlooked unless the possibility of aneurysm is considered.

Dr. Jones (closing on his part).—I have nothing further to say except in connection with Dr. Nicolson's paper. In doing work about the Gasserian ganglion, I have found great comfort from preliminary ligation of the external carotid artery, which can be done in a few minutes. It may be done under local anesthesia. This is not in accord with the teaching of those who do most of the work of this kind.

Dr. Nicolson (closing on his part).—I want to mention two cases in connection with Dr. Horsley's paper that have come under my observation, one in which it looked like a clear case of injury of the external coats of the artery from traumatic aneurysm, produced by a small 22 caliber bullet, with no evidences of hematoma, and closed in a few days, and six months afterward I operated on this young man for a large traumatic aneurysm of the femoral artery.

Less than two months ago I saw a case on which I operated in which this hard, fixed growth was implanted just in the base of the axilla between the anterior and posterior poles. It was supposed at the time to involve the upper border of the breast, but apparently the pathologist did not cover that point, as it was a carcinomatous tumor adherent to the chest wall and there was evidently misplaced mammary tissue growth at that point.

Dr. Horsley (closing).—If I may be permitted, I would like to discuss Dr. Nicolson's paper for a moment. His work on the external carotid is valuable. It is necessary for the general surgeon to be more at home with the carotid than he usually is. On the other hand, I think sometimes work can be done without unnecessary ligations. Ligation, even when done fairly well, is not always free from danger. While that may not be the experience of all surgeons, it is certainly my own personal experience. I have done about 12 operations upon the Gasserian ganglion, either total or partial extirpation, and the only patient I lost was one of the early cases in which I attempted to ligate the external carotid.

I have recently lost a case by secondary hemorrhage in which I did an extensive operation for cancer of the jaw. The patient

had a poor chance inasmuch as the cancer originated in the gums, involved the parotid gland, and there was quite a mass of affected glands beneath the jaw. I made a block dissection, taking out the sternocleidomastoid from below, doubling ligating the deep jugular, cutting the lower jaw in front at the symphysis, and taking out the right half of the lower jaw in one block with the other tissue. I ligated the external carotid as it comes off from the common carotid, The wound necessarily was infected. Although we tried to close the wound from the inside, we found it was too extensive. Food came over the wound but she made apparently a satisfactory recovery. There were one or two sinuses two weeks after operation, and she was about to go home, when there was some bleeding at the point of drainage just above the clavicle, We packed it and it stopped. That night she had a terrific hemorrhage, transfusion was about to be done, but she died before we got her to the operating room. We held a postmortem. The ligature of plain iodin catgut put around the external carotid just at its origin had cut through the artery, and the blood came out of the sinus.

In regard to the mammary gland, I do not wish any one to misunderstand me in that respect. Misplaced mammary gland tissue in the axilla is not uncommon. Local carcinoma misplaced is not common.

In regard to the point Dr. Mason made, I think that a misplaced mass in the axillary space should be removed on general principles. If it is mammary gland tissue it is liable to friction or irritation from the movements of the arm, and if you remove a benign growth of the normal mammary gland, it seems to me an abnormal tumor of this kind should be removed.

LIGATING THE INTERNAL ILIACS AND THE PERCY CAUTERY AS ADJUNCTS IN THE SURGICAL TREATMENT OF CARCINOMA OF THE UTERUS

By E. P. Hogan, A.M., M.D.
Birmingham, Ala.

September, 1915, there was turned over to me in the Hillman Hospital a patient, Mrs. W. T. H., a white woman, who had been cauterized in August, 1915, for an inoperable carcinoma of the uterus. The cauliflower mass, involving the entire cervix uteri, with extensive recto vaginal and pelvic involvement, had reformed. It was a pathetic case and appeared to be an absolutely hopeless one. For some time before I had been reading the literature on uterine carcinoma and had become interested in the work of Dr. J. F. Percy in this class of cases. I was, however, very skeptical of the results in the cases reported by him. In this case I decided that something should be done. I sent for her husband and brother and explained to them the hopelessness of the case, and urged them to send her to Dr. Kelly for radium treatment. They had no means or at least I could not get them to send her to Baltimore. We had no radium at the Hillman Hospital. The question was: Shall I send this woman home helpless and hopeless or shall I keep her in the hospital and do my utmost in trying to help her. I decided to do the latter, and I have since done the same with all similar cases.

Uterine carcinoma cases may be classed as:

1. The Operable Cases. Those cases in which the disease is confined to the cervix or fundus. This class of cases should have the complete operation—the internal iliacs ligated, the Percy cautery applied, and the radical abdominal hysterectomy.

2. The Border-line Cases. Those in which the disease involves the cervix and may extend to a limited extent on the adjacent walls of the vaginal mucosa. The parametrium may also be involved to a limited extent on one or both sides. This class of cases should have the internal iliacs ligated, the Percy cautery applied, and if possible the complete radical abdominal hysterectomy. If it is not possible to do the complete operation the internal iliacs and one or both ovarians should be ligated and the Percy cautery applied. After two weeks or more the cautery may be reapplied if indicated. The abdomen is not opened for the reapplication of the cautery. I have applied the cautery more than ten times to the same case.

3. The Inoperable Cases. Cases in which the disease involves the cervix, the vaginal mucosa, the bladder, the rectovaginal septum, and the pelvic contents form a hard, firm, immovable mass continuous with the pelvic walls. The cases of this class may be so bad from hemorrhage and secondary infection, and may have such heart and kidney complications as to appear to preclude the possibility of doing anything. The worst of these cases, however, may be cauterized. The cautery does not produce great pain in these extreme cases, due, doubtless, to the large amount of necrotic tissue. By giving a hypodermic of morphin the cautery may be used. If the condition of the patient permits an anesthetic should be given, the abdomen opened, and the internal iliacs and one or both ovarians ligated, all visible and palpable lymphatic glands removed, and the Percy cautery applied. The cautery should be reapplied as often as indicated.

REPORT OF CASES

Case I.—Mrs. W. T. H., a white woman, admitted to Hillman Hospital September 27, 1915. Complaint: profuse uterine hemorrhage. No family history of cancer, otherwise unimportant. She has had the ordinary diseases of childhood. Menses began at age of fifteen, regular and lasted for three or four days. Married at the age of eighteen. Has had five normal deliveries, all children living and well. Cervix lacerated when third child was born and was not repaired.

The present malady began in February, 1915, following a normal delivery. She noticed a thin, watery discharge which at times would become bloody. The discharge had a very foul odor. For the past three months the patient has had a profuse hemorrhage from the vagina. Patient is anemic. Urine negative. Physical examination negative, except as noted.

Speculum and bimanual examination by Dr. M. Y. Dabney: "Vaginal outlet martial; cervix forms a huge cauliflower growth, which extends outward on all sides, involving the rectovaginal septum; uterus immovable from lateral fixation of the growth, bleeds very easily; a small fragment is broken off for microscopic examination.

"*Conclusion.* The case is totally inoperable. Her best chance would be radium treatment, which cures one out of every three inoperable cervical cancers. In lieu of this I would suggest the Percy cautery. Rectal examination confirms vaginal findings. Abdomen negative except for tenderness across the lower portion, especially the center."

Operation. October 15, 1915, by Dr. E. P. Hogan, assisted by Drs. J. D. Sherrill and L. C. Woods. Abdomen opened by median incision from umbilicus to pubes. Trendelenburg position; intestines packed off with gauze packs out of hot normal salt solution. Dr. Dabney's findings

confirmed. Right and left iliac arteries were ligated one-half inch from bifurcation of common iliac. Left ovarian ligated. An assistant's hand grasped the body of the uterus, his fingers extending to and embracing the corporacervical juncture. The operating field and assistant were protected by sterile sheets and towels. The patient was rapidly prepared, as for a curettage. The cauliflower mass was cauterized with the Percy cautery. High heat was used for the cervical mass, low heat was then used, and the cautery inserted into the cervical canal. This heat was applied for twenty minutes. The cautery was removed for a few seconds at intervals. After the cauterization a piece each of iodoform and sterile gauze were placed in the vagina. This was gradually removed after the third day and replaced by the same character of light pack. Patient was very much improved and went home October 29, 1915, fourteen days after the operation.

November 20, 1915. Patient was readmitted to Hillman Hospital.

November 30. Patient was anesthetized with ether, and the Percy cautery applied to the carcinomatous cervix, fundus, and vaginal walls. A large protruding hemorrhoid was removed by the cautery.

December 8. Anterior lip of the cervix practically absent. Posterior lip bears evidence of carcinoma, but there is no hemorrhage, no discharge, no odor. Patient is permitted to go home, to return in one week.

December 13. Patient is readmitted to Hillman Hospital.

December 17. Ether anesthesia, cauterization of cervix, vaginal walls and rectovaginal septum.

December 23. Vaginal packs removed, no discharge, no odor, marked improvement.

December 24. Patient permitted to go home for Christmas.

January 3, 1916. Patient readmitted to Hillman Hospital.

January 14. Ether anesthesia, cauterization of cervix, fundus, and vaginal walls.

February 2. Morphin grains one-fourth; no anesthesia, cauterization of cervix, fundus, and vaginal walls; low heat.

February 23. Ether anesthesia, cauterization of cervix, fundus, and vaginal walls; low heat.

March 8. Ether anesthesia, cauterization of cervix, fundus, and vaginal walls.

March 21. There is marked improvement.

March 25. Patient is permitted to go home for a few days.

March 29. Patient is readmitted to Hillman Hospital.

March 29. Ether anesthesia, cauterization of cervix, fundus, and vaginal walls.

April 5. Patient is permitted to go home for one week.

April 13. Patient readmitted to Hillman Hospital and examined; marked improvement noted.

April 24. Ether anesthesia, cauterization of cervix, fundus, and vaginal walls.

May 6. Patient permitted to go home for ten days.

May 16. Patient readmitted to Hillman Hospital. At this time there was no evidence of the former carcinomatous condition and a radical hysterectomy was advised.

May 20. Patient refused operation and went home.

July 18. Patient returned to the hospital with no evidence of former carcinomatous condition of cervix or vagina. I asked Dr. M. Y. Dabney to examine patient. His notes are: "Patient looks well; cheeks are full; she reports that she feels in the best of health. Mucous membrane of good color."

Vaginal Examination. "Slight, white, non-stringy leucorrhea (patient had not douched in some days). No cer-

vix found, instead there is a transverse depression, ovoid in shape, about 2x1 cm. There is no demonstrable os. No bleeding or raw area. Tissues look white and feel a little less elastic than normal. Even after much manipulation there is no bleeding. Nothing can be satisfactorily outlined laterally *per vaginam.*"

Rectal Examination. Uterus and growth comprise a mass in bulk the size of a baseball, but flattened anteroposteriorly. It is retrodisplaced and firmly attached to pelvic wall. Very firm and not very painful. Pressure fails to remove the mass to any great extent. The right iliac glands are palpable, three or four in number, from 1 to 1.5 cm. in diameter and movable. None felt on left side. Retrorectally on left posterolateral wall, about 7 or 8 cm. inside of anus, is a movable gland 1.5 cm. in diameter and near it is another 0.5 cm. in size.

Impression. The removal of the foul growth of the cervix and its replacement by smooth growth of soft tissues as well as general improvement of the patient seems less than marvelous. The examiner does not believe panhysterectomy, however, would remove all the growth and metastasis.

May 20. Patient went home to return within ten days.

August 16. Patient was readmitted to the Hillman Hospital.

August 29. Laparotomy, complete radical abdominal hysterectomy. Large lymphatic glands posterior to the rectum were removed. Recovery was complicated by an abdominal and a vaginal fecal fistula, but they responded readily to normal salt irrigations and the patient made a complete primary recovery.

October 30, 1916, she went home. She appeared well and felt well. There were two enlarged lymph glands posterior to the rectum, but otherwise there was no evidence of the former carcinomatous condition.

Pathological Report by Dr. M. Y. Dabney. "Frozen sections, hematoxylin and eosin stain; one block from fundus, one from cervical extremity, one from ovary, and several bits of unrecognizable tissue. Carcinoma is found in only one block, and that is what seems to be a lymph gland. The stroma is made up of connective tissue; many large empty spaces from which the cell nests have been lost. Elsewhere the tissue is infiltrated, with irregular masses of epithelial cells of the squamous type. They vary considerably in size and staining quality, and are characterized by their wild growth and appearance."

December 6. Patient returned to the hospital and was examined. The enlarged glands posterior to the rectum have increased in size. Enlarged pelvic glands can be palpated through the abdominal wall. There is no vaginal hemorrhage or discharge and no evidence of the former carcinomatous condition of the vagina.

Case II.—Mrs. A. B., age forty years, a white woman. Admitted to Hillman Hospital October 19, 1915. Complaint: vaginal discharge and hemorrhage.

Family history negative. Has had ordinary diseases of childhood, also typhoid and pneumonia. Menses began at age of thirteen; regular. Married at age of thirteen. Mother of three children, full term. Two of the children dead, one living and in good health. Has had three miscarriages. At birth of first child cervix was badly lacerated and has not been repaired. Of late vaginal discharge has increased with some blood. The discharge has offensive odor.

Vaginal and bimanual examination: Badly torn, nodulated cervix, which bleeds on being sponged. Specimen of cervix on microscopic examination proves to be carcinomatous.

Pelvic examination. Negative except for tenderness in either iliac region.

Operation. October 26, 1915. Laparotomy; median incision from umbilicus to pubes. Trendelenburg position. Intestines packed off with gauze packs out of hot normal salt solution. Iliac glands enlarged. They were removed. Internal iliac arteries ligated. Cervix cauterized, followed by radical abdominal hysterectomy. Patient did well and went home December 17, 1915. She has returned to the hospital several times for examination, and says her health is good. No vaginal hemorrhage or discharge. She appears to be in perfect health.

Case III.—Leona C., colored woman, aged 35 years, admitted to Hillman Hospital January 4, 1916, complaining with pain in back and hips and a profuse, offensive, bloody vaginal discharge.

Family history negative. Has had ordinary diseases of childhood and stomach trouble. Menses began at age of fourteen, regular until present trouble began about fifteen months before entering hospital. Married at age of nineteen. Four children, all living. No miscarriages.

Vaginal and bimanual examination: Large, necrotic, cauliflower mass, with a very offensive odor filling vagina. Evidence of secondary infection. Vaginal walls, bladder and rectum carcinomatous. A large, firm mass fills the pelvis and on the left side extends to the iliac crest.

Operation, January 6, 1916. Laparotomy; median incision from umbilicus to pubes. Trendelenburg position. Intestines packed off with gauze packs out of hot normal salt solution. Internal iliac arteries ligated. Cauterization of cervix, fundus of uterus, and vaginal walls. Pelvic mass as hard as a brick.

February 1, 1916. Morphin grain ¼; no anesthetic. Cervix, fundus, and vaginal walls cauterized for twenty minutes; low heat.

The vaginal discharge ceased and cervix and vaginal walls healed and appeared well, but the patient was anemic

and appeared to have a systemic carcinomatosis. She would not eat. She died March 31, 1916, apparently of general carcinomatosis.

Case IV.—Mamie H., colored woman, aged forty years. Admitted to Hillman Hospital December 6, 1915. Complaint: pain in back, hips, and lower limbs, and a profuse, bloody discharge.

Family history negative. Has had ordinary diseases of childhood and malaria. Eight years ago had stomach trouble, shortness of breath, and swelling of feet and legs. Menses began at thirteen. Regular and not painful until present trouble began in October, 1915. No history of lues. Has two children living and in good health. Lungs negative. Heart has definite soft systolic blow, second pulmonic accentuated. Good compensation. Patient urinates frequently and bowels constipated. Complains of pain in lower abdomen, pelvis, hips, and back.

Speculum and bimanual examination: Perineum intact, posterior lip of cervix forms a cauliflower mass which fills the entire vagina. Anterior lip, walls of vagina, rectum, body of uterus, adnexæ, and pelvic walls involved. Uterus forms a part of the pelvic mass, which is immovable. Urine showed trace of albumin when she was first admitted to the hospital; absent now. Red blood cells, 4,000,000; white blood cells, 8000; hemoglobin, 80 per cent.

Operation, December 18, 1915. Ether anesthesia. Laparotomy; median incision from umbilicus to pubes. Trendelenburg position. Intestines packed off with gauze out of hot normal salt solution. Internal iliacs tied; iliac glands removed; destructive cauterization of mass in vagina and cauterization of pelvic mass through uterine canal, with low heat. Vagina lightly packed with plain sterile gauze.

Patient was again cauterized January 18, February 1, February 18, and March 8, 1916. After the last cauteri-

zation the patient was able to be up and insisted on going home. I have not seen her since and have no definite information as to her present condition.

Case V.—Z. R., colored woman, aged forty years. Admitted to Hillman Hospital March 29, 1916. Complaint: pain in lower abdomen and a profuse, bloody vaginal discharge.

Mother died of tuberculosis. Father died of heart disease. Has had ordinary diseases of childhood. Menses began at fourteen and always regular until one year ago. Has been bleeding continuously for the past year. At times almost bleeds to death. Had a profuse hemorrhage March 22. Mother of nine children, seven living. Two children died of pneumonia. Youngest child five years old. She has been confined to bed for past five months suffering with vaginal hemorrhage, pain in lower abdomen, and backache. She is nauseated, constipated, and anemic, and has lost in weight for past few months.

Lungs negative, soft systolic murmur heard at apex of heart. Abdomen large and pendulous. Hard mass in pelvis. Kidneys negative.

Vaginal and bimanual examination: Perineum relaxed; lips of cervix obliterated; vaginal walls, bladder, and rectum involved in a carcinomatous mass which fills the pelvis. Profuse, foul discharge from the uterus.

Operation, March 31, 1916. Vaginal walls cauterized and cauterization of mass through uterine canal for forty minutes; low heat. Patient's condition was much improved, and she was permitted to go home April 10, 1916.

Case VI.—Racheal D., colored woman, aged fifty-three years. Admitted to Hillman Hospital April 6, 1916, complaining of pain in lower part of abdomen and vaginal hemorrhage and discharge.

Father dead, cause unknown. Mother killed accident-

ally. One sister living and in good health. No family history of tuberculosis or carcinoma. Has had ordinary diseases of childhood. Menses began at age of sixteen, regular. Married at age of seventeen. Eight living children and one dead. Youngest child seventeen years of age. Menopause five years ago, at forty-eight.

Began bleeding and having offensive discharge in June, 1915. The discharge is tinged with blood, and it is very free and offensive. Her associates complain of the odor. Patient has severe pain at intervals in the lower abdomen. For the past few months patient has lost a large amount in weight. Good appetite; bowels regular but painful defecation. Frequent urination and passes large amount of urine of cloudy appearance. Albumin and sugar negative. Large clots of blood pass from vagina and pieces of rotten flesh with a very offensive white discharge. Lungs negative. Systolic murmur heard at apex of heart; slight edema of lower limbs.

Vaginal and bimanual examination: An infected, bleeding, cauliflower cervical mass fills the vagina. Vaginal walls, bladder, and rectum carcinomatous. Pelvis filled with hard mass, which is tender on pressure.

Diagnosis. Inoperable, infected carcinoma of the cervix uteri, involving vagina, bladder, rectum, body of uterus, adnexæ, and pelvic walls.

Operation. Laparotomy; median incision from umbilicus to pubes. Large iliac glands removed from either side; ligation of internal iliac arteries. Cauterization of cervical mass, fundus uteri, and vaginal walls. Patient improved rapidly, but there was still some discharge.

April 22, 1916. Patient was cauterized again; low heat; marked improvement followed; no vaginal discharge.

May 10. The improvement was such that I felt justified in advising a radical abdominal hysterectomy. Patient declined. Her appetite was good; she felt well. She

said: "I came to the hospital to die, but I am going home well." She went home May 14, 1916. Have not seen or heard from her since.

Case VII.—Mrs. W. L. M., white woman, aged thirty-seven years, from Leeds, Alabama, sent in by Dr. E. P. Pruitt. Admitted to Hillman Hospital March 5, 1916, complaining of pain in lower abdomen and back and an offensive vaginal discharge and hemorrhage.

The hospital records show that this patient was admitted to the hospital January 16, 1915, and that the diagnosis of her trouble at that time was "inoperable carcinoma of the uterus." The record also shows that the cervix uteri was cauterized by Dr. L. C. Morris and that she went home January 30, 1915.

Patient gives the following history: Mother living and well. Father dead, cause unknown. One brother dead, cause appendicitis. One sister living and well. No tuberculosis in family. One uncle and one aunt died with cancer. Has had ordinary diseases of childhood and typhoid fever. Had good health until about two years ago. January, 1913, began irregular bleeding from vagina. Lost in weight. Was treated in Hillman Hospital, January, 1915, and felt well until January, 1916, when she began bleeding. Has been bleeding continuously since then and has an offensive discharge. Menses began at age of fourteen. Married. Mother of eight children, five living and well. Had one still birth; one child died one day after delivery and one died of pneumonia. Youngest child is six years old.

Speculum and Bimanual Examination. Perineum lacerated, entire cervix involved in a carcinomatous mass which bleeds freely. Carcinomatous growth involves the vaginal tissue surrounding the cervix. Lungs and kidneys negative.

Operation, March 9, 1916. Laparotomy; median incision from umbilicus to pubes. Trendelenburg position.

Intestines packed off with gauze packs out of hot normal salt solution. Ligation of internal iliac arteries, cauterization of cervix uteri and adjacent vaginal walls. Cauterization of fundus of uterus and radical abdominal hysterectomy. Actual cautery was used in removing uterus from vaginal connections, and an effort was made to destroy with the cautery the carcinomatous vaginal tissue. Vaginal tissue and peritoneum closed separately with catgut. Raw surfaces covered over. Abdominal incision closed with drainage, two suprapubic cigarette drains. Vagina lightly packed with iodoform gauze.

Patient made an uneventful recovery and went home April 10, 1916. There was no evidence of carcinomatous tissue in vagina; no discharge.

April 25. Patient returned for examination. There was no discharge, but there appeared a small raw surface at the point of union in the vaginal wall. This surface was cauterized with low heat and lightly packed with iodoform gauze. She went home May 7, 1916, looking well and feeling well. No vaginal hemorrhage or discharge.

Patient was seen July 15, 1916, and she stated that she felt perfectly well. She had no hemorrhage and no discharge.

Case VIII.—Mrs. M. J., white woman, age forty-five years. Admitted to Hillman Hospital May 11, 1916; sent in by Dr. G. W. Rogers, of Birmingham. Chief complaint: bleeding from vagina.

Father dead, cause accidental. Mother dead, cause unknown. Two brothers and two sisters dead, cause unknown, but she believes one sister died from cancer of uterus. She has had ordinary diseases of childhood. Menses began at eleven, regular and not painful until ten months ago. Married at sixteen. Six children living and one dead. Youngest six years old. One miscarriage three years ago. Has been bleeding from vagina for past six months. Hemorrhage has been so great that she has

become exhausted. Pain on pressure in iliac regions. Heart, lungs, and kidneys negative.

Speculum and bimanual examination: Perineum relaxed, cervix large, eroded, and patulous, and bleeds freely. Uterus movable and retroflexed. Tenderness in iliac regions, but no masses made out.

Diagnosis. Operable carcinoma of the cervix uteri, although the woman appears to be in a very bad condition.

Operation, May 16, 1916. Laparotomy; median incision from umbilicus to pubes. Ligation of internal iliacs. Cauterization of cervix uteri and radical abdominal hysterectomy. Gall-bladder was examined and found to be greatly distended and full of stones. The original incision was closed with drainage, two suprapubic cigarette drains, and a small piece of iodoform gauze was placed in the vagina. A right rectus gall-bladder incision was made and the gall-bladder opened. Eighty gall-stones, each about the size of a navy bean, were removed. The gall-bladder drain was removed on the fourteenth day, but drainage from the gall-bladder continued for about three weeks longer. Patient went home June 18, 1916, in good condition. No vaginal discharge. She was seen July 16 and appeared to be in fine condition. No vaginal discharge. She stated, however, that her left foot swells, and at times she has pain in her left leg.

She was seen again August 2, 1916. No vaginal hemorrhage or discharge and no pain in left leg. She feels perfectly well. She was seen November 28, when she stated that her health was never better.

Case IX.—Annie G., colored woman, aged fifty-three years. Admitted to Hillman Hospital May 15, 1916. Complaint: pain in lower abdomen and persistent hemorrhage and an offensive discharge from vagina.

Father and mother dead, cause unknown. Five sisters and five brothers living and all in good health. Two

brothers and one sister dead, cause unknown. No history of tuberculosis or carcinoma. Menses began at sixteen; have been regular until present trouble began. Married at twenty. Seven miscarriages. Last one about January 1, 1915. Has been bleeding continuously from vagina since September, 1915.

Speculum and bimanual examination: "Vaginal outlet martial. Cervix considerably enlarged. Cauliflower growth around os and deep ulceration on right side of os 1 cm. in diameter. Necrotic base. Bleeds very easily; slightly offensive odor. Fundus knoblike, about size of egg; movable. Extremely tender everywhere, but especially in left iliac, where there is a large mass, size of a baseball, firm and continuous with cervix.

Rectal examination: No hemorrhoids seen or felt. Sphincter tonus good; walls smooth. Mass at left side of pelvis better felt than *per vaginam.*

Impression: Advanced carcinoma of cervix involving left adnexa. Would advise Percy cautery, followed by destructive cauterization of cervix and operation later. Diagnosis too plain to justify incision for specimen." (Dr. M. Y. Dabney, May 17, 1916.)

Operation, May 20, 1916. Laparotomy median incision from umbilicus to pubes. Ligation of internal iliacs, cauterization of cervix and vagina, and radical abdominal hysterectomy. The actual cautery was used. Every effort was made to destroy by cautery all carcinomatous tissue. After destroying the vaginal tissue involved the vaginal mucosa, pelvic fascia, and the peritoneum were united in layers with No. 2 iodized catgut. All raw surfaces were covered over. Incision was closed with two suprapubic cigarette drains. Drains were removed on the fifth day and a fenestrated rubber tube was inserted for a few days. Patient made a good recovery and went home June 11, 1916, apparently in good health. No vaginal discharge,

no hemorrhage, and a perfect vaginal union, with no sign of the former carcinomatous involvement.

Case X.—Mrs. Jesse P., white woman, aged sixty years. Admitted to Hillman Hospital March 28, 1916, complaining of pain in lower abdomen and a vaginal discharge.

Father and mother dead, cause unknown. Two brothers living and six dead, cause unknown. Two sisters living and two dead, cause unknown. One niece died of cancer. Has had all the ordinary diseases of childhood, and pneumonia and typhoid fever. Was operated on thirteen years ago for tuberculosis of the bowels. Her uterus was removed three years ago for cancer. Patient could not give the name of operator or hospital. Vaginal cauterization in New Orleans in February, 1916.

Menses began at age of fourteen; regular and not painful until menopause ten years ago. Mother of five children, youngest thirty-five years old. Five years ago began having hemorrhages and offensive discharge.

Diagnosis. Recurrent carcinoma following hysterectomy three years ago. Vaginal walls, bladder, rectum, and pelvic walls involved. A cone or crater extends from the vagina into the carcinomatous mass in left iliac region. The walls of this cone are necrotic. Vaginal walls bleed on being lightly sponged.

March 30, 1916. Cauterization. Ether anesthesia; cauterization of vaginal walls and carcinomatous mass.

April 12, 1916. There was no hemorrhage or discharge, and patient went home.

Patient returned about June 15 for examination, and further cauterization was advised. She went home to return for this cauterization within a few days. She has not been seen since.

My cases are too recent and too limited for conclusions, but I desire to add my approval of the epoch-making plan of treatment as advocated by Dr. Percy.

I believe the aim or purpose of the Percy treatment should be not only to improve the patient temporarily, but, if possible, to render the case operable. If this stage is reached and there is no metastasis the complete radical operation should be done. In the worst cases the hemorrhage, discharge, and pain can be relieved, and in some there are apparent cures.

In my early experience with the complete radical abdominal hysterectomy for carcinoma in operable cases my results were most disappointing. It appeared to me that an operation with a primary mortality so high was one to be avoided, and I did avoid them when possible.

Since using the Percy cautery and ligating the internal iliacs and draining all cases of carcinoma of the uterus when doing the complete radical abdominal hysterectomy I have not had a death. Five radical abdominal hysterectomy cases are reported in this series. Other cases have been done by the same technic, but they are omitted from the cases reported because they were early cases, and the diagnosis was based on macroscopic and clinical evidence. They could not be classed as positive carcinoma cases, but I am practically positive they were.

In doing the complete radical abdominal hysterectomy for carcinoma of the uterus I would urge the ligation of the internal iliacs, removal of all visible and palpable lymph glands, thorough sterilization of the vagina, and the use of the Percy cautery. The vaginal mucosa adjacent to the cervix should be severed by the cautery and the involved vaginal mucosa destroyed by the cautery. This technic in my cases has been most gratifying.

Ligating the internal iliacs and the Percy cautery are adjuncts in the complete radical abdominal hysterectomy for carcinoma of the uterus, which will greatly reduce, if

not altogether prevent, any primary mortality in operable cases; and ligating the internal iliacs and the Percy cautery, if persistently applied as a preliminary, will render some inoperable cases operable, and the lives of those cases that do not become operable will be prolonged, free from hemorrhage, discharge and pain.

SUBTOTAL THYROIDECTOMY

By Willard Bartlett, A.M., M.D., F.A.C.S.
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Incomplete relief for a comparatively large percentage of toxic goitre patients after unilateral thyroidectomy long ago convinced me that something more extensive in the way of operative therapy was indicated in many of these cases. It was then natural to add ligation of the opposite thyroid vessels, and, later on, a partial resection of the second lobe at the time of the original operation. It was only after being driven to a considerable number of secondary partial lobectomies that I became thoroughly convinced that we must make the original operation more extensive than had originally been contemplated if we were to expect the complete relief of toxic symptoms in a large percentage of these patients.

The desirability or even the necessity of removing, at times, a large percentage of thyroid tissue from both sides seems to be a rather recent outgrowth of unsatisfactory experience in this work. Kocher, in earlier editions of his *Technic,* makes no mention of bilateral lobectomy, and gives only a few lines to bilateral resection.

How different is now the inclination at the Mayo Clinic as expressed by Balfour,[1] "In the large majority of these cases the process of disease is not confined to one lobe. Although one lobe may be much larger than the other, yet a similar condition exists to a lesser degree on the opposite

side. Extirpation of a single lobe and isthmus in this type is rarely a satisfactory operation. It is therefore necessary in many of these cases to remove portions of both lobes. This fact is well illustrated by statistics from the Mayo Clinic during 1913. Of 783 non-toxic thyroids, 533 were classified as multiple adenomas or diffuse colloid, the remainder being single adenomas, cysts, etc. Of these 533 an extirpation of one lobe and isthmus was performed in 18 per cent.; in 25 per cent. one lobe, the isthmus, and part of the opposite lobe were removed, while in 57 per cent. a double resection was done. This is suggestive and indicates that greater efforts are being made in the surgical treatment of goitre to obtain not only satisfactory results, but to obviate as much as possible a recurrence of the condition."

The same author is convinced that no distinct line can be drawn between toxic and atoxic goitres, as shown by the following: "It is well known that goitres which for some years have produced no recognizable symptoms may gradually become associated with marked degenerative changes in other organs, particularly those of the cardio-vascular system."

We surely can find justification for the removal of relatively large amounts of thyroid tissue as a routine procedure. There are, of course, isolated instances in which the ablation of a cyst or of a solitary adenoma may completely satisfy the requirement at hand; that this cannot be true in the great majority of cases, however, becomes apparent when one contemplates the enormous Mayo Clinic experience summarized by Balfour,[1] viz.: "It is difficult to classify with any simplicity the various changes which are found in enlarged thyroids which are not associated with symptoms of disturbed function. It is accepted in our clinic that the non-toxic goitre is one in which there is no evidence of an epithelial hyperplasia or hypertrophy

sufficient to characterize the gland. These simple enlargements of the thyroid may therefore be conveniently divided into two groups: (*a*) symmetrical or thyroidal-shape goitres; (*b*) asymmetrical or nodular goitres (MacCarty).[4] In the first group the diffuse hypertrophic colloid is the most typical and frequent, and is seen chiefly in the young individual. That this type of gland may undergo cellular hyperplasia and produce constitutional symptoms is recognized. Between this glandular hypertrophy and the typical hyperplastic thyroid every possible pathological picture may be presented, which explains the confusion existing in classifying these changes. The second group, or the asymmetrical enlargements, are practically always due to single or multiple adenomas. The essential pathology of many of the atoxic goitres examined in our clinic is confined to the presence of single cystadenoma. In 45 per cent., however, the increase in size is due to multiple adenomas of various types (Wilson).[5] These are seldom confined to one lobe, although, as a rule, one lobe, usually the right, is considerably larger than the other. On the other hand, nodular thyroids may still retain considerable resemblance to symmetrically enlarged thyroids. Adenomas may undergo almost any form of degeneration cystic (though true cysts are rare), fatty, necrotic, hemorrhagic (recent or old), calcareous, hyaline, malignant, etc. Various combinations of these may be found in the same gland following the primary condition of multiple adenomas."

Does it not then seem rational to conclude that the needs of most goitre patients will be met by a type of routine operation which removes a large percentage of thyroid tissue, especially if a symmetrical reconstructure of small lateral lobes is made?

Balfour [1] writes, after an exhaustive literature study: "The function of the thyroid in the human being is problematic. It has long been known that the gland is abso-

lutely necessary to normal metabolism, and that its rôle is probably dependent on an internal secretion, yet in spite of extensive experimentation the true active principle in this internal secretion is still unknown. Neither has its method of action been discovered. Thus far our knowledge is practically limited to the fact that iodin in various combinations, particularly thyroidin, discovered by Baumann in 1895, is an essential to the thyroid, but as yet no chemically pure substance which retains its physiological activity has been isolated. The gland is indispensable to the maintenance of healthy life, and in order to explain its function innumerable experiments have been made and many theories advanced, but all such theories are still conjectural."

It is hardly germane, in a purely technical study of this kind, to consider goitre as anything but a tumor in the broadest sense. Still I must add, for the sake of completeness, that a preliminary study of these cases is facilitated by following Plummer's [3] division of them into four groups: (1) non-hyperplastic atoxic; (2) non-hyperplastic toxic; (3) hyperplastic atoxic; (4) hyperplastic toxic.

When we come to consider exophthalmic goitre one cannot discuss fully in a paper on technic the important matters of preliminary ligation, condition of the patient, skill, experience and judgment of the individual operator, etc. It is sufficient for the purpose in hand to assume that we are dealing with a patient who finds herself in a quiescent interval and is fit as she can be made for the removal of thyroid tissue. The question which here confronts us is the amount to remove. Balfour [1] answers it in the following words: "In our clinic the removal of a large part of the hyperactive gland is practised, and, so far as is known, there have been no symptoms which might be due to deficient thyroid secretion in any of the patients with exophthalmic goitre. The entire right lobe, isthmus, and a

part of the left lobe, sometimes as much as four-fifths of the active gland, should be removed as a rule. It is not at all unlikely that, in performing a so-called total extirpation of a lobe, small, almost imperceptible pieces of gland tissue may be retained which will perform a part of the thyroid function. Although the tendency is to remove more of the gland, yet practically never is less gland retained than the size of the normal gland."

Hunnicutt [10] did extensive removal of dogs' thyroid with the result that no myxedema appeared when an exceedingly small percentage of the gland was left behind.

The subtotal removal of one of the system of ductless glands, viz., the thyroid, no doubt has some effect on the others related to it, though very little definite clinical knowledge exists on this subject. Halsted,[9] after extensive experimentation, discusses the effect upon the other ductless glands, notably hyphysis and parathyroids. He thinks that the changes which have been noted in other ductless glands after almost complete thyroidectomy, even if colloid is found in their substance, may be evidences of normal or hypo-activity rather than of compensating hyperactivity.

C. H. Mayo [11] struck the keynote of my subject when he wrote after 5000 goitre operations had been performed at Rochester: 'Operation in cases of hyperthyroidism appears to give about 75 per cent. of cures, while the remaining 25 per cent. are more or less benefited, according to the degree of complication and the stage of the disease. Probably 19 per cent. have some degree of relapse in from one to three years after operation, usually manifested by the return of symptoms. In these rare cases further operation by ligating the vessels, and in most cases by removal of a portion of the remaining lobe, improve the condition of the patient by reducing the amount of thyroid secretion.

As stated by C. H. Mayo,[11] the secretion of the thyroid has very much to do with mental and physical develop-

ment. The technic proposed herewith must then be employed only in the treatment of adult patients.

1. The Skin Incision. Kocher's collar incision seems best adapted to the surgical exposure as well as to the later cosmetic requirements. The examination of many necks after operation, from my own and other clinics, demonstrating scars varying in shape from the letter "U" to a straight line, convinced me that an incision cannot be most advantageously placed after the patient is in the recumbent position, with the chin elevated. It is taken for granted that most women will want to cover the scar for the first year at least with a chain or string of beads. (A few will consent to wear a ribbon over a high transverse cicatrix which has resulted from an attempt to excise old ligation scars.) What is then more logical than to mark (Fig. 1) the neck with the patient in the usual erect posture and having a chain falling naturally just where she desires it (Fig. 2) so long as this remains compatible with surgical requirements. Since I have followed this custom a slender chain has accurately fitted every scar, to the intense satisfaction of those chiefly concerned.

2. Position of Patient. In elevating the upper part of the patient's body we are simply taking advantage of an age-old principle, calculated to minimize bleeding in the field of operation.

The head is thrown back as far as possible (Fig. 3) without interfering with respiration, thus giving the utmost prominence to the tumor and facilitating its ultimate delivery. My attention was long ago attracted to the advantages of this position by C. H. Mayo.[8] The head must be raised later on to facilitate closure of the wound, else very considerable difficulty may be encountered in handling the structures which have been divided in a transverse plane.

3. The Anesthesia. Various forms of local anesthesia are employed by all of us in selected cases, but since the

Fig. 1.—Marking the line of incision while the patient is in the upright position.

Fig. 2.—Chain falling naturally in position to cover scar.

Fig. 3.—Patient in position for operation, with head thrown back as far as possible without interfering with respiration, giving prominence to the tumor and facilitating ultimate delivery.

Fig. 4.—Author's anesthesia apparatus.

Fig. 5.—The sheets surrounding the site of operation and covering the patient's body are carried up over the face, thus securing for the operator a perfectly free field.

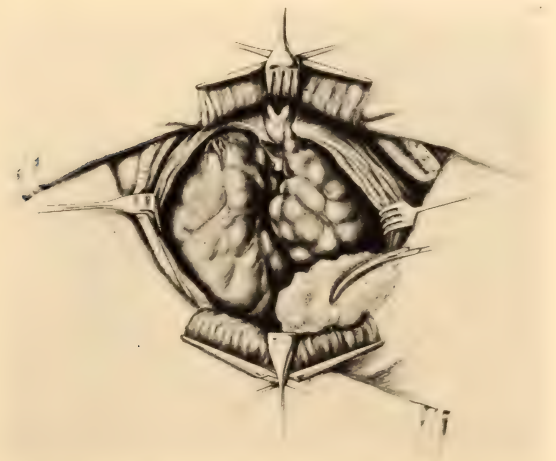

Fig. 6.—The lateral lobes of the thyroid are exposed by the customary transverse division of the ribbon muscles.

Fig. 7.—The lateral thyroid lobes are luxated out of their beds and the superior thyroid vessels divided.

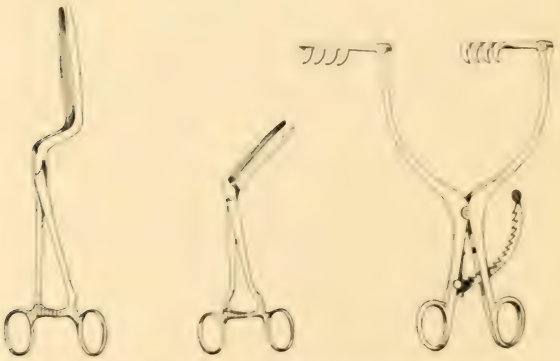

Fig. 8.—Clamps used in author's technic.

Fig. 9.—Two strokes of the knife so as to leave a wedge-shaped defect divide the major portion of the lobe.

Fig. 10.—Showing stump left after right lobe of thyroid has been cut off. Operator tying first ligature.

Fig. 11.—Following amputation the defect is rapidly closed with catgut suture.

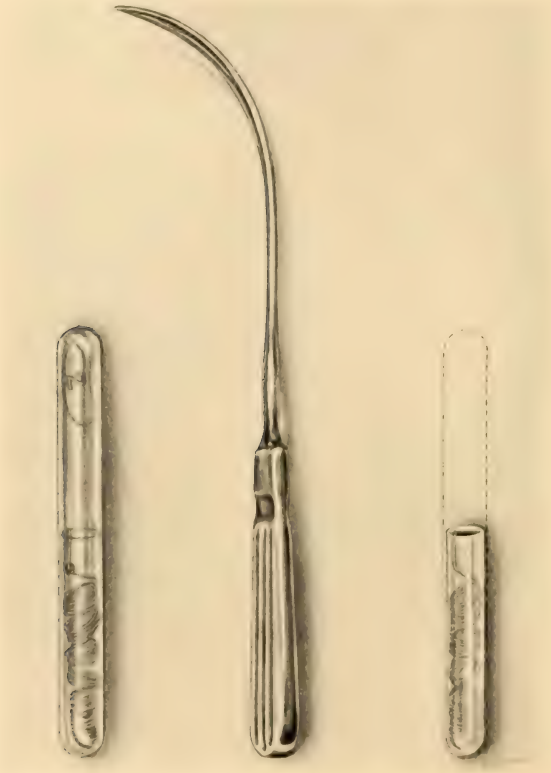

Fig. 12.—Tubular containers with lateral opening through which strands of catgut are withdrawn.

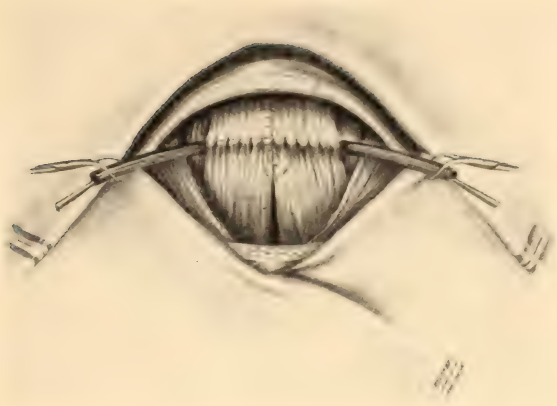

Fig. 13.—A split rubber tube is laid transversely across the defect and the ribbon muscles are sutured over it.

Fig. 14.—The platysma is sewed accurately and the skin is closed with a No. 0000 Chinese silk on a No. 12 non-cutting cambric needle.

Fig. 15.—Shows the position of the patient in bed directly after removal from the operating room.

widest requirements will be met by the administration of ether, this method only will be discussed here. The employment of the otherwise highly useful drop-method has two distinct disadvantages in connection with neck work. (*a*) The mask is in the way and (*b*) thoroughgoing asepsis is prejudiced hereby. These disadvantages are overcome by the use of the intratracheal cannula of Meltzer, and indeed this admirable idea is almost indispensable in a very few instances where collapse of the trachea is to be feared. For routine practice, however, a much less exacting technic will answer all the requirements which present themselves in this special field. Two nasal catheters are passed into the pharynx, connected to a glass "Y" which has its stem coupled up to an ether vapor flask and foot bellows as shown in Fig. 4. After the mouth has been closed with adhesive plaster the sheets which surround the site of operation and cover the patient's body are carried up over the face (Fig. 5), with the result that the operator secures a perfectly free field and gains a singular feeling of security.

4. Hemostasis en Masse. The lateral lobes of the thyroid are exposed in the customary manner by transverse division of the ribbon muscles, and, if possible, luxated out of their beds and the superior thyroid vessels divided, thus completely freeing the upper pole (Fig. 6). (I formerly ligated in continuity and at some distance from the gland, both inferior thyroid arteries as well as the large vessels entering the lower poles. The first of these two steps endangers the blood supply of the parathyroids, and both are wholly superfluous if only a reasonable amount of care be taken with the manner to be immediately described.)

Each lateral lobe is next grasped in the plane of intended amputation, between the blades of a spring clamp (Fig. 7) and compressed only tightly enough to shut off its blood supply. Sometimes it is necessary to divide the isthmus

before such a pedicle can be isolated, although this is to be avoided if possible. Care should be exercised to prevent the spring pedicle clamp from slipping back on to the parathyroids and recurrent nerve. This can be accomplished by applying three or four pairs of forceps to the goitre just behind the intended plane of compression. The major portion of the lobe is divided from the stump with two strokes of a knife, leaving a wedge-shape defect. This is rapidly closed up with catgut sutures (Fig. 8) and the compression clamp removed. If the work has been rather accurately done there is usually no bleeding at all, or at most, only a very few small points, which have escaped notice, spurt, and are readily controlled by a supplementary stitch or two. The lateral lobule, which is reconstructed in this way, will, of course, vary in size with the judgment, experience and inclination of the operator. For reasons stated elsewhere in this paper I incline to remove a very large proportion of any thyroid which is producing toxic symptoms, provided, of course, that I succeed in leaving behind what looks and feels like relatively normal gland tissue. The residuum on either side of the trachea has, in my own hands, frequently not been larger than a pecan nut, varying, of course, with the original size of the tumor and the character of the material at hand.

5. Ligation. Permanent control of the many blood-vessels divided constitutes a relatively prominent feature of the goitre technic, hence it has been accorded special attention. I have had ten feet strands of fine catgut coiled up in tubular containers (Fig. 9) having a lateral opening through which it is withdrawn as needed. This package fits snugly in the palm of the left hand, and there is no possibility of its contents coming in contact with anything, whereas the loose strands which we have used heretofore must necessarily be dragged over the field with the possibility of contamination. Ligature material handled in

this way does not get soaked in tissue juices, therefore does not become slippery and forms itself into unusually secure knots. After it is tied and threads cut the short length held in the right hand constitutes the only waste.

Economy in the use of this product becomes at once apparent, since a ten-foot strand can be produced at very little more expense than the five-foot strand in ordinary use. No iodin is employed in the storing fluid for physiological reasons too obvious to mention.

6. Wound Drainage. A few operators are sufficiently careful and clever to always leave a goitre wound so dry that it can be closed without drainage. Many others can accomplish the same thing if the patient's welfare is not prejudiced by the length of time required for them to do this. The average surgeon, however, will experience more satisfaction by draining goitre fields as a routine practice. The usual mid-line drain through the original incision practically always produces an inequality of the wound edges. As a rule, the upper lip rolls up, and while, as a usual thing, it becomes smoothed out in the course of months, occasionally this deformity remains permanent. In many instances the adhesion which runs directly from the skin to the deepest part of the wound leads to a marked deformity because the tissue planes cannot readily slide over each other. There is at times a deep depression at the drainage-point, and occasionally tracheal irritation in consequence of the cicatrix having become attached to this important structure.

For a year past I have been draining my goitre wounds through a small split rubber tube which is laid transversely (Fig. 10) across the defect and allowed to emerge at both extreme angles of the incision. Over this are sutured the ribbon muscles high up, and in a lower plane the platysma with skin separately. When this tube is withdrawn the skin edges coapt themselves so perfectly that an observer

who sees the patient twenty-four hours later for the first time is unable to tell whether drainage has been employed or not. It is needless to say that no scar at all is left and that the medium portion of the wound looks altogether different from those which have been drained in the old way.

The critic might assume on first thought that a tube so placed fails to serve its proper function because it does not lie in the most dependent portion of what is, frequently, a very extensive defect. Uniformly satisfactory experience has, however, attended the use of such drainage; this is perhaps accounted for by the fact that we can, by changing the patient's position, make any desired portion of the cavity its most dependent one.

My experience with drainage leads me to conclude that when employed at all it should be for a rather protracted period. Some of my patients would have been better off had the drains been left in for one week rather than have been taken out at the end of one day. Somewhere between these two extremes lies the period which will ultimately be determined upon.

7. Skin Closures. The appearance of a skin scar on the face or neck means so much to a woman that we are justified in minimizing the disfigurement all we can. With this in mind I first sew the platysma accurately and then use for a skin suture No. 0000 Chinese silk, mounted on a No. 12 non-cutting cambric needle. These push their way through the skin without cutting, and hence create a mark so fine that it can hardly be seen. The thread is left in place only twenty-four hours if the patient can then bear its removal, and no more than forty-eight hours in any event. The silk has not commenced to cut in by this time unless originally too tightly drawn, and the result will surprise the observer who sees it for the first time.

These tiny needles are so difficult to thread that I have

had them stamped on to the end of silk strands, which are held in readiness for a variety of other purposes too obvious to mention.

8. Position in Bed. Hypersecretion from the mucosa of the trachea follows goitre operations, which entail much handling of this tube. The mucus runs down, accumulates in the lower air passages, and is expelled with the greatest difficulty, contributing very largely to the discomfort usually incident to this operation. A surprisingly smooth convalescence can be secured as far as this complication is concerned by putting the patient to bed on her face (Fig. 11), with a pillow under the chest, directly after she is removed from the operating room. If she maintains this position, or some slight modification of it, for only the first few hours during which hypersecretion is most in evidence the result will, as a rule, be all that can be desired. The inhalation of steam or very moist air will further contribute largely to her comfort during the twenty-four to forty-eight hours which follow her operation.

Twenty-six patients operated on in this manner have shown results which in every way approached the ideal. All but one left the hospital very greatly improved as far as concerns the symptoms with which they entered. Of course the number is not large when compared with some present-day statistics, but perhaps there are enough of these cases to furnish suggestions for a future line of treatment. The list embraces every variety of generalized thyroid disease, and apparently the operation is equally efficacious, no matter what the form of the pathological lesion.

In no case have symptoms of thyroid deficiency appeared, although eighteen months have elapsed since the first operation in this series was done. There has not been a symptom of "recurrent nerve" injury in the list, but three patients may have had symptoms from the parathyroids. One of

these three, who was operated on six months ago, experienced the only wound infection in the list, and after being free from symptoms for four weeks, suddenly fell in, what her physician considered, an epileptic seizure. She has had one of these same attacks every three or four weeks since, with suspicious tetanus-like closure of the jaws and stiffness in the hands. She has resisted treatment with calcium salts and parathyroid feeding; still, to be entirely fair, one must consider a possible secondary parathyroid change, even though we can positively state in this case that the region in which they are situated was not invaded at all. In a second patient we saw rigidity of the lower jaw muscles and hands ten hours after one of these operations, when a large hematoma was discovered deep in the neck. The symptoms promptly disappeared as soon as the blood was liberated. A third patient exhibited trismus for an hour or two the night after her thyroidectomy, but has shown no disturbance of any kind up to this time, five months later. The only patient in this series who has died experienced a postoperative psychoses, which ended fatally eighty-two days after the operation. Her complete history follows:

No. 6056; Miss C.; aged twenty-nine years; single; born in Illinois; saleslady by occupation. Patient comes from a neurotic family; has two sisters who are insane; no goitres or tuberculosis in the faimly.

Previous health had only been fair. She has always been extremely nervous, and a definite strain of melancholia was admitted, very probably dating from an unfortunate love affair, resulting in the birth of a child seven years ago. Her life has been one of worry.

Upon visiting the office her complaint was nervousness; she had a tremor of only a few months' duration; palpitation of the heart and tachycardia of one month's standing. During the past month patient had complained of profuse

sweating and insomnia. General loss of strength was marked during the last few months. Patient also had a chronic cough with expectoration, and gave a history of frequent sore throat. Menstrual history was practically negative.

Examination revealed a frail woman, five feet two inches in height, and weighing only ninety-two pounds. Her skin was dry and muddy in appearance and gave evidence of pruritus and alopecia. Her goitre was moderately large, the right side being larger than the left. There was a definite thrill over the arteries on the right side. The voice was normal. There was no other evidence of pressure except slight dyspnea. Exophthalmos was not present, and the various eye symptoms were entirely missing. Patient had a definite tremor. Her heart was violently overactive. Temperature, 100°; pulse, 112; respiration, 20; systolic blood-pressure, 114; hemoglobin, 80 per cent. Urine was pale in color. Specific gravity, 1000; alkaline in reaction; faint trace of albumin; no sugar; no casts.

She entered the hospital and after three days of rest was operated on. Through a short collar incision we removed both halves of the thyroid and the isthmus as well as the left pyramidal lobe, and reconstructed the right and left lobules about one-half the size of the operator's index finger, using through-and-through drainage, and approximated all divided muscles and skin.

Patient was returned to bed, with apparently very little shock from the operation. Regular postoperative treatment for goitre was instituted. During the next few days in the hospital she evidenced severe melancholia, and was frequently entirely irrational, having to be restrained in her bed at times. Five days after operation the goitre wound had entirely healed, and her further stay in the hospital was characterized by days of absolute insanity, with short periods of rational behavior. The father took

the patient home twenty-one days after operation. Several weeks afterward we accidentally found her in the observation ward of the city hospital. When seen there she was in a semistuporous condition, greatly emaciated, and apparently of no mind. She died two months and twenty-two days from the time of operation, her death evidently being from extreme inanition.

While subjective improvement has left nothing to be desired in this series, still I do not take it into consideration when writing of results, since many of my earlier patients, subjects of incomplete operations, have declared themselves subjectively well, though the circulatory and other systems, on careful examination, were found to be far from normal. I never had, however, seen rapid pulse, high blood-pressure, etc., return promptly to the absolute normal in a large percentage of toxic goitre patients until I began to perform subtotal thyroidectomy. (Of course, one should not expect the repair of permanent anatomical lesions in a long-neglected toxic case.) A comparison of the original and ultimate findings in all these cases will be published after more extended observation of the patients has been made.

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DISCUSSION

Dr. J. M. T. Finney, Baltimore.—I have been much interested in this paper of Dr. Bartlett's. For some years I have been a heretic in the matter of the orthodox ideas and practices in the treatment of hyperthyroidism. In the first place, my results were not satisfactory when the patients were treated according to the old accepted ideas. In the second place, when I came to examine carefully the basis of these ideas, it did not appeal to my reason or judgment. I am speaking now more particularly of the very toxic cases; they are a group everybody is familiar with. The others will take care of themselves. I used to put them to bed, give them rest, ligate one artery, and later, possibly another vessel, and finally do something more radical, taking out one lobe or part of a lobe or the isthmus and so on. I lost two cases from simple ligation. I did it as quickly and as skilfully as I could, and made as little disturbance as I could, but they died. That seemed to me to be quite a large percentage. If they die when you do the least you can do, they could no more than die when you do the most you can do. That was the idea with which I started. This was about five years ago when I began to do what I understand Dr. Bartlett is doing now, that is, practically a subtotal resection of the thyroid gland without preliminary ligation. I do not know the explanation, but as I have figured it out in my own mind it amounts to this: that there was a vicious circle of internal secretion that gave rise to the unpleasant symptoms; that when you irritated that circle somewhere in its circumference you started something going that you could not control or stop, and the patient died as a result. It seemed to me that if I could break that vicious circle completely at some point, shatter it absolutely, there would be no chance for a comeback, and that if a patient survived the shock of the operation, he or she, as the case may be, would get well. That was the idea I had in my mind, entirely empirical, based on nothing at all except close observation of and dissatisfaction with existing conditions and results. After talking the matter over with these first patients, who happened to be sensible people, and with whom I could be perfectly frank, I decided, with some trepidation to do what seemed to me to be well worth trying, that is, to take out at one sitting all except a small

portion of the thyroid gland. I did not remove quite as much then as I am doing now, because I did not dare to. These patients were quite ill for the first forty-eight hours. After this length of time convalescence was rapid, and in ten days their general condition was approximately down to normal. These patients have since remained perfectly well, and free from all unpleasant symptoms.

I have had since that time, roughly speaking, about 50 of the severely toxic cases. I am speaking now only of this type of case. I have lost of that group four. That is a high mortality rate. I think one of the reasons for this is that some of my kind friends have dumped on me some of their worst cases, and I have accepted them simply because, it seemed to me, they were cases that had nothing to look forward to and something had to be done, and I was willing to make the attempt provided they understood the situation. I have always been frank with my patients and never have tried to deceive them. When they came in I would tell them about the operation, that some day an operation would be necessary; that it was more or less a serious operation, but that the vast majority of cases did well and got well. Then, after keeping them in bed for a few days until they got acquainted with the surroundings and with me, I would operate. About that time the patient has usually gotten over her nervous disturbance and has gained confidence in you, and then it is wonderful what she will let you do. I find the best results in dealing with patients in that way, and in talking it all over with them frankly. I have reference now particularly to patients who are sensible. The vast majority of them are more sensible than we give them credit for, provided we talk sense to them.

It has never seemed to me reasonable to ligate one vessel or even two in a structure that had such a free blood supply as the thyroid gland, particularly when it was followed by such a comparatively high mortality rate. Therefore, starting on the supposition that we were dealing with a vicious circle, and that if we could smash completely that circle at some one point, we could control the situation. If we did less than that we stirred up something; we started something going that we could not stop. The operation is simply this: to expose the gland in any way in which you are accustomed, and it strikes me that Dr. Bartlett's way is very satisfactory; ligate the vessels at the upper right corner or pole, but always aim to leave a bit of thy-

roid tissue at that point. This may not be larger than the tip of the little finger; where possible also have a little thyroid at each of the lower poles. At the upper left pole leave a larger portion. That varies in different individuals, but I never aim to leave a portion larger than the first joint of my thumb, that is the most that I have left in these cases.

The more toxic the case is to start with, the less gland tissue I leave, or the more I take out at one sitting. There is a tremendous reaction at once after the operation. The pulse will go up and likely become irregular. The patient will be flushed, and will have an exacerbation of the symptoms that have existed. I feel sure that if I can keep my patient alive for forty-eight hours, she will get well. That is the crucial time in these cases. In the first few cases I did not give morphin or digitalis because they were supposed to be contra-indicated. After that, it seemed foolish not to give morphin in cases presenting these symptoms, so I gave them enough in small doses to keep them quiet. Then digitalis was given to slow down the heart and to make it more regular. I used sometimes the infusion and sometimes the newer preparations, but digitalis in some form during the first forty-eight to seventy-two hours. Always in these cases ice-caps were applied to the head, to the throat, and to the heart. Then, as this was probably a toxic condition, it appeared reasonable that we should aid elimination as much as possible. So we started at once salt solution by rectum, using the Murphy drip. Sometimes the salt solution was used intravenously. To summarize, the treatment is simply this: leave a little of the gland, if possible, at each corner, more at the upper left corner, than at the others. Use morphin, if needed, and digitalis as indicated, and salt solution as much as will be taken up to six or more liters; in one case I gave eight liters in the first forty-eight hours. The more the better to aid elimination, and one will find in these cases that the pulse will rapidly drop to normal. Within a week the results are often astonishing. After a week or ten days the patient will frequently say, "I have not got a heart any longer." In some of these cases before operation the heart will pump so vigorously that it shakes the bed. I do not know of a class of cases that has impressed me more with the immediate results of the operation than this class. The mortality rate is high, it is bound to be high in any kind of treatment. I think in my list of cases the mortality is a little bit high because of the kind attentions of some of my friends.

Dr. J. Sheldon Horsley, Richmond, Virginia.—I would like to say a word or two about anesthesia, inasmuch as the essayist showed one lantern slide of a method of giving anesthesia in these cases. I have been using the Gwathmay's method of rectal anesthesia, and while it is not perfect, the recent modifications are more satisfactory than the method he used at first; that is, giving paraldehyd and using a smaller amount of ether, not more than five ounces of the mixture. The mixture consists of three ounces of ether and two ounces of oil. If this is given in bed, the patient usually becomes unconscious before he is taken to the operating room. It does away with preliminary fright and with the objection Dr. Bartlett mentioned of having a cone and the anesthetizer in the way sometimes. If this technic is followed out and if colon lavage is practiced, these cases recover just as promptly from the anesthetic as they do when it is given by inhalation. I do not mean to say that it is a good routine anesthetic. Occasionally it does not do at all, and sometimes you will have to supplement it by inhalation anesthetic. But, as a rule, if you have the time, if you are very busy you can put it off until the last case, and if you follow it through carefully and take half an hour to get the patient under, it will in most cases prove most satisfactory.

Dr. E. Denegre Martin, New Orleans, Louisiana.—The question of anesthesia is of great concern to us all, and especially to patients. When ether is given by the drop method the patient begins to choke and frequently you have trouble in that way. We have been using for several years the Kell's apparatus. We use this apparatus, giving gas right out of the cylinder, just enough to anesthetize the patient. The patient goes to sleep in a minute, and then ether is turned on. We use the warm vapor immediately afterward. These patients rarely know they have taken ether. They do not choke and cough. This method of anesthesia has been resorted to by us in over 1200 cases with no secondary effects. The patients frequently wake up just about the time the operation is over or a few minutes afterward. There is rarely any nausea and seldom bronchorrhea. If any of you use this apparatus, you will find it far ahead of the old method. Especially is this true of head and mouth work. Our specialists in New Orleans use it for throat work. It gives steady anesthesia and the results are gratifying.

Dr. V. P. Blair, St. Louis, Missouri.—I have been much impressed with Dr. Finney's talk, as I have been thinking exactly

along the same lines as he has for a long time. For years I have been taking out all thyroid tissue I could take out short of crippling the patient.

I have had a higher percentage of mortality from ligations than from thyroidectomies. I still stick to the ligation as a preliminary to thyroidectomy.

There is one thing I have been following up, and that is quieting bad cases with morphin. It seems to me it cannot be done to advantage.

Dr. Legrand Guerry, Columbia, South Carolina.—I have this sort of an experience: here is a woman who is suffering with acute violent attacks of Graves's disease. She has lost thirty or forty pounds; she has a large pulsating thyroid; she has a pulse of 130 or 150. She is having temperature, diarrhea; she has vascular symptoms, and is a very unfavorable risk we would say for a radical operation. In a routine case of that kind I have done simply ligation of one of the vessels with the hope of cutting down the circulating gland and improving the condition of the patient until she became a safe surgical risk. We have had three deaths from simple ligation. Feeling that way about ligation and having this experience with it, and having a disappointing experience in lobectomy as being incomplete, I have drifted into the same practice practically that Dr. Finney has with these cases of Graves' disease. In fact, we have discussed this matter together very frequently.

I want to give statistics of a few cases, not many. In this connection I am reminded of the preface in Mr. Bland Sutton's work on gynecology which covers about three lines. He says: "When physicians will learn to restrain their vanity and cease from publishing long lists of uninteresting cases, then the accomplished facts of our science can be presented in more convenient form." Since doing subtotal thyroidectomy, removing both lobes and isthmus, leaving the capsule and about one-sixth of the gland which, as Dr. Mayo has said, is necessary to carry on proper function of the gland, in 60 cases I believe we have had two deaths. Nearly 85, possibly 90 per cent. of symptomatic cures. The other 15 or 12 per cent. are better, and one or two of them are apparently not much better. In the cases with advanced secondaries with parenchymatous heart, it is a more formidable operation; it is more difficult to do, but until I run into a snag and lose a number of cases, I believe if we do a radical operation, cutting down the amount of thyroid gland, so that

they cannot get enough thyroid secretion, we will get better results than we would achieve under a smaller number of attacks.

Dr. Bartlett (closing).—In view of the frank statements that have been made about mortality, I wish to say that I have had as large a mortality as any one in thyroid work, and in this series of 25 cases I brought down the mortality, due perhaps more or less to luck or an approved technic and a good selection of cases. But I have just as much claim to mortality as any other surgeon in thyroidectomy.

GASTRIC CANCER: JEJUNOSTOMY TO STOMACH REMNANT

By Frank D. Smythe, M.D., F.A.C.S.
Memphis, Tenn.

The essayist is not in a position to supplement the knowledge possessed by the Fellows of the Association upon the subject of cancer in general or cancer of the stomach in particular, and my reason for bringing this subject before you for discussion is the hope that as a result of the discussion some plan may be evolved that will encourage the general practitioner to advise his patients with cancer of the stomach henceforth as he now does his patients with cancer of the uterus and cancer of the breast—namely, immediately after diagnosis is made they are referred to a surgeon that insists the growth be removed with an unsparing hand at the earliest possible moment.

Early stomach operations are but slightly more hazardous than the radical breast operation, and does not approach the mortality of the radical operation for cancer of the uterus. Nevertheless, in the face of such well-known and indisputable facts many practitioners who could not be induced to treat a case of cancer of the womb or cancer of the breast, or cancer elsewhere, medically, continue to treat medically and dietetically their cases of cancer of the stomach until the patient's flesh and strength have departed and the tumor is readily palpable and plainly visible before consultation with a surgeon is deemed advisable.

He apparently does not realize that cancer of the stomach, like cancer of the breast, is essentially a surgical disease; and the 100 per cent. of deaths that have resulted before in cases treated in a similar way does not influence him to alter his plans nor adjust his bearings. The wonderful achievements of the master surgeons in operations upon the stomach certainly have not impressed the general practitioner to the same extent nor so favorably as has been the case in operations upon other regions and organs of the body. He is halting between two opinions, and there is no excuse for but one opinion. He is not convinced that it is his duty to protect his cancer of the stomach cases against the certainty of death by urging early operation. Have we discharged our full duty as molders of professional and public opinion regarding this important subject? I think not.

We should hearken unto the cry of the chronic gastric ulcer (precancerous) patient and early cancer cases and protect them from the inevitable doom awaiting him in the not distant future, if deprived of timely surgical intervention, and never let up in our efforts in that direction until every physician in this broad land will be made to feel that his professional duty, and his duty to the state has not been properly discharged until he has succeeded in placing his cancer cases and doubtful stomach cases in the hands of a competent surgeon. Such a policy would result in the saving of many valuable lives annually that are now needlessly sacrificed as a result of the plan of inaction and doubt pursued by so many physicians at the present time.

The public should be taken into our confidence and given more direct and first-hand information than has been done in the past. Education and enlightenment of the public concerning the significance of certain gastric symptoms, which may lead up to cancer, or be due to cancer, so that they will understand that early operation is the cure—and

the only cure—will prove our most effective weapon in combating cancer of the stomach. Then and not until then will cancer cases reach the surgeon habitually at a time when the disease is recent, local, and curable by operation.

Too much emphasis cannot be placed upon the value of treating surgically all cases of chronic gastric ulcers. Mayo, Moynihan, Ochsner and others (Mayo in particular) have demonstrated beyond a reasonable doubt that from 65 to 80 per cent. of cases of cancer of the stomach were preceded by a history of ulcer, more or less typical, and generally of long standing.

It is not my purpose to convey the idea that all, or nearly all, cases of gastric ulcer terminate in cancer, but to remind you of the statistics concerning the high percentage of cases of cancer developing upon an old ulcer, and the value to the individual and to society of the cure of the ulcer by excision or resection, and to beat 75 per cent. of cases of cancer at least by preventing their development (a la peritonitis).

Every physician engaged in the practice of his profession has the opportunity many times during his career to play a conspicuous part in the game of life-saving. The success of the surgeon's efforts depend now and will always depend upon the ability of the family physician to recognize symptoms suspicious of cancer of the stomach and to diagnose the disease during the early stage of its existence plus his confidence in the curability of the disease if operated upon while it is a local affection.

We must not get away from that fundamental if we are to succeed in lowering the death-rate from cancer of the stomach. Extensive operations and improvement of technic are important advances and will always be welcome by us, but can never outdistance nor equal the advantage of early operation for cases of cancer of the stomach or cancer situated elsewhere.

It is taken for granted that all the methods at our command have been utilized properly in order to enable us to arrive at a positive diagnosis of the disease—certainly a probable diagnosis will have been reached before any operation is decided upon.

Treatment. *Surgical.* (a) Prophylactic. (b) Radical. (c) Palliative.

Prophylactic: Prophylactic treatment consists in excision of chronic ulcers favorably located of small size and not too hard. The method of Rodman is the method of choice in certain types of ulcer near the pyloric orifice.

Radical: Partial gastrectomy in practically all cases with gastrojejunostomy. The extent of the stomach removed varying with the location and size of the cancer. Regardless of the smallness of the neoplasm it is advisable to divide the stomach on a line some considerable distance from the supposed limits of the growth. Pathologists have demonstrated to us that the disease spreads between the serous and mucus surfaces in advance of its spread on those membranes, hence the advice to go wide of the mark.

Gastrectomy, or complete removal of the stomach, is a justifiable surgical procedure and has resulted in saving life in several instances, though the indications for its performance exists relatively rare. Incomplete though extensive partial gastrectomy is very often demanded and affords the patient a better chance of having his life prolonged and the only chance of a cure. Posterior jejunostomy with the stomach remnant completes the operation. The operation includes of course the removal of the lymph nodes from the cardia to the duodenum on the lesser curvature and the glands on the under surface as well as the pancreaticoduodenal glands. None available for safe removal capable of detection should be left. The statistics of Miculicz and Kronlin, while not so recent as the statistics of the Mayo clinics, show that some lives have been saved by the opera-

tion of partial gastrectomy, and that the lives of cases operated were prolonged upon an average of eleven months.

W. J. Mayo has reached the highest point of success perhaps of all surgeons in stomach work, and the statistics submitted by him in the *Journal of the American Medical Association* for 1908 and 1910, leaves no doubt in the mind of the seeker after truth and makes plain the duty of the physician regarding the proper treatment of his cases of cancer of the stomach.

Advantages of gastrectomy extensive incomplete over gastrojejunostomy alone in advanced cases of stomach cancer are:

1. The life of the patient is prolonged on an average of eleven months following the operation and an occasional though unexpected cure is affected. The average life of the patient after gastrojejunostomy only was 6.4 months in cases operated upon at the Mikulicz clinics.

2. The extensive partial gastrectomy includes removal of the infected and sloughing cancer. The patient's local distress is almost immediately relieved. The desire for food very soon returns, the meals are relished, nausea and vomiting, the eructation of fluids and belching of foul gases vanishes, and the patient's general condition rapidly improves. A substantial gain in weight and strength occurs and continues to increase up to a maximum point for several months in the advanced cases a year or more in the late cases, much longer in the average case. The improvement following gastrojejunostomy is evident in a great many cases, though never so pronounced nor of the same duration as in the cases in which the pathology has been removed.

3. Extensive incomplete gastrectomy performed by an unfinished surgeon is attended by a prohibitive mortality rate due directly to the surgical interference, and what I have to say in advocacy of the operation does not apply

except when performed by a finished surgeon. The operation, while considered formidable by the general practitioners and the laity, is concluded by the masters quickly, safely, and successfully, and with but little if any higher mortality rate than that of gastrojejunostomy when the operation is performed upon the type of cases demanding the extensive operation.

Mayo says that gastrectomy may with great benefit be performed not only as a possibly curative operation, but deliberately as a palliative when growths are present in inaccessible glands and in the liver.

No one is better qualified than Mayo to guide us in the right direction in regard to the subject, and I do not believe that we should deny those cases the benefits offered by operation so habitually as has been our custom in the past.

4. It is my policy to withdraw, without interfering, if after a careful survey the conclusion is reached that it is impossible to remove the original pathology *in toto*.

Palliative Measures Surgical in Nature: Palliative measures are measures resorted to for the purpose of prolonging life for a few days or for a few weeks, such as duodenostomy or jejunostomy, and are justifiable procedures when property interest and matters of state are involved. Ordinarily the best policy in such cases is not to interfere surgically. Much has been written concerning the technic of the operations mentioned, and it is of common knowledge.

A case recently under treatment presented so many points of interest and bearing directly upon the foregoing that I have decided that it was worth while to report it somewhat in detail in this connection and to call attention to some of the points, perhaps with which you are already familiar, regarding the technic of the operation and its extent:

E. N. B. Male, aged fifty-eight years; farmer. Father died of pneumonia at sixty-three. Mother of puerperal fever at thirty. His wife developed a cancer of the corpus uteri four years ago. Hysterectomy was done and she is alive and well today.

Past History. Pneumonia of left lung, at the age of twenty-one. He was sick for five years, had fever most of the time, with troublesome cough, and lost weight and strength. He apparently made a recovery from this and remained well until twelve years ago. Twelve years ago he had an attack of severe pain in the region of the stomach followed by collapse, which lasted several hours. He has suffered with digestive disturbances since that time, such as flatulence, nausea, vomiting at times, and hyperacidity; has never vomited blood. Pain has been an important factor, varying in duration and degree. His skin has always been readily affected by the sun's rays, and unless protected by gloves, broad-brimmed hat, or umbrella would blister and peel off. The course of the disease was almost unvarying until February, 1916, and he was of the opinion that medical and dietetic treatment proved helpful.

Present Trouble. Began February, 1916, with an attack of pain in the left hypochondrium, extending to the right side, including the epigastric region, and his suffering has been increased by eating or drinking. A diagnosis of pellagra was made and treatment for that affection was prescribed. He continued to lose in strength and flesh, and was compelled to abandon his labors. About the middle of August a lump was detected by the patient above and to the left of the umbilicus. It was freely movable and somewhat tender upon pressure. He was put to bed by his physician with a diagnosis of ulcer or cancer. Reinhardt's ulcer diet and the application of an ice-bag to the epigastrium was prescribed. He grew steadily worse, and at the

end of two weeks was advised to continue the treatment, as he was too old and entirely too weak to be subjected to operation.

He went to the Battle Creek Sanitarium for further medical treatment, impressed with the idea that surgery was contra-indicated. The tumor was now of good size and rather rapidly increasing, and could be felt regardless of the position of the patient. Interpretation of fluoroscopic inspections by Dr. J. T. Case on several different occasions is incorporated.

Case of E. N. B. If there are gall-stones present we are unable to recognize them with the *x*-ray. It is, of course, quite possible for gall-stones to be present, having too small amounts of lime salts to be visible roentgenologically, and our negative report does not for a moment rule out gall-stones.

Stomach. Lower border two and a half inches below the interiliac line, patient standing, stomach filled. Peristaltic waves normal on greater curvature. On lesser curvature, mostly on the posterior wall of the stomach, there is an irregular filling defect such as is seen in carcinoma. Emptying time of the stomach less than four and a half hours. Duodenal bulb normal.

Small Intestine. Iliac stasis, more than twelve inches of ileum remaining, filled at the ninth hour. Terminal ileum freely movable. Ileocecal valve incompetent, permitting at least ten inches of ileum to fill at the time of the colon injection.

Colon. Cecum movable. Appendix shadow not seen at any time. Spasticity of the iliac and pelvic colon. At the ninth hour the barium column had reached the splenic flexure. At the twenty-sixth hour the colon was filled excepting the ampulla, the patient having had a bowel movement emptying the ampulla only by that time. At the fiftieth hour, there was still a considerable residue in

the colon. The pelvic colon rose fairly well at the colon injection. No hindrance noted to the entry or exit of the barium enema.

Summary. No gall-stone shadows recognized. A filling defect on the posterior wall of the stomach near the pylorus. Emptying time of the stomach less than four and a half hours. Ileocecal valve incompetent. Iliac stasis. Cecum movable. No information concerning the appendix. Spastic iliac and pelvic colon. Colonic stasis, longer than fifty hours, required for emptying the colon, the examination suggesting a functional rather than an organic cause. J. T. Case.

Reëxamination with reference to the stomach and small intestines was made by Dr. Case, but as the patient left the sanitarium so shortly thereafter he did not acquaint him with the result of the reëxamination, and I was deprived of the value of the information gained by the last examination until after the operation had been performed. I communicated with Dr. Case and requested him to furnish me with the data, and herewith incorporate a copy of his reply.

Reëxamination of case of E. N. B. I reëxamined the patient with reference to the stomach and small intestines. I am satisfied that there is a tumor in the stomach involving the posterior wall and also the lesser curvature near the pylorus. This tumor has characteristics which would indicate carcinoma, but there are several smaller defects which would indicate a cauliflower growth or possibly papillomata of the stomach.

I was unable to find any abnormality in the small intestine. The lesion is sufficiently near the pylorus that the patient can be given the benefit of the doubt and operation advised. I certainly would recommend an operation in this case. J. T. C.

Physical examination upon admission to St. Joseph's Hospital. Male, well developed. Badly nourished; greatly emaciated. Face capillary stasis, some scaling. Teeth bad, Riggs' disease. Heart and lungs normal, action somewhat enfeebled.

Abdomen scaphoid; resistance increased, especially in midline. Tumor detected to left of midline, extending downward toward the umbilicus and reaching one inch upward to the right. It was tender upon pressure, freely movable, and disappeared upward and backward to reappear upon change of position of patient. No tenderness upon pressure over the appendix or gall-bladder.

Clinical Diagnosis Preoperative. Adenocarcinoma of the stomach.

Blood examination: White blood cells, 5000; red blood cells, 2,966,666. Hemoglobin, estimated, 60 per cent.

Operation. The operation was performed November 9, three months after the presence of the tumor was known to the patient, although he was under constant medical treatment and supervision.

After the usual preliminary preparation, under ether anesthesia, the operation was performed as follows:

Incision from near the ensiform to the navel to the left of the median line. The liver was at once palpated, then a survey of the stomach and duodenum was made. The tumor was plainly evident, though but few adhesions existed. The lymph nodes of the lesser curvature in the region of the cardia were enlarged, also the glands situated along the under surface of the grinding portion of the stomach. No enlarged glands were detected in the hilum of the spleen.

Size and Location of the Tumor. The tumor extended from a point opposite the lower pole of the spleen to within one inch of the pylorus and upward on the anterior wall of the stomach to its superior border, the distance of the

greater part of the lesser curvature. The floor of the stomach and about one-eighth of its posterior wall was involved. Only a small area on the posterior wall of the grinding portion of the wall of the stomach was free from disease. The first step of the operation upon the stomach consisted in the ligation of the pyloric artery. The second step, the gastroepiploica dextra. In the third step of the gastroepiploica senestra the main branch of the gastric was ligated near the cardia, completing hemastasis.

The gastrohepatic omentum was ligated in sections and divided between the ligatures. The attachment of the greater omentum was severed after ligation. The duodenum was divided between clamps one inch from the pylorus. The mucous coat was severed with the cautery. The opening was closed with through-and-through sutures and catgut, and further protection was afforded by the use of a few seroserous sutures and linen.

The free end of the stomach was turned upward and outward. Two clamps applied to the body of the stomach in a downward direction, obliquely and to the left. The stomach was amputated, the serosa and muscularis divided with scalpel, and the mucosa with the cautery. Control of the stomach before removal of the clamps was secured by the use of guy strings as practised by Moynihan. Marginal approximation with through-and-through sutures with catgut reënforced with a row of linen closed the stomach opening.

The operation was completed by doing a posterior gastrojejunostomy to the small stomach remnant.

Comments. One hour was occupied in performing the operation. The patient left the table in good condition and has not vomited since operation. He drank beer the second day, and on the third day was permitted to sit up in bed; at the end of the first week a semisolid diet was prescribed. He has had no pain, nausea, flatulence, or

belching since the operation; has gained in weight and strength, and is taking exercise on the hospital lawn; feels better than he has felt for the past twelve years. It was two weeks after the operation when these notes were made.

Gross specimen referred to Dr. William Krauss for examination.

Case of E. N. B. Examination of specimen submitted shows extensive infiltration of submucosa and muscularis, with rapidly growing gland epithelia forming plugs and incomplete tubules. Diagnosis: Adenoma destruens.

WILLIAM KRAUSS.

Letter received from Dr. J. L. Dunavant, Kenning, Tenn., the patient's physician, dated December 6, says:

"In regard to E. N. B.'s condition, he is improving. His weight yesterday was 121½ pounds. He is much stronger, and has a splendid appetite. Suffers no discomfort."

DISCUSSION

DR. J. GARLAND SHERRILL, Louisville, Kentucky.—I think Dr. Smythe is a little too severe on the medical man. The former teaching was that cancer of the stomach could not be diagnosed without the presence of a tumor and cachexia. It is only in recent years that the profession have awakened to the fact that we must not wait for tumor and cachexia before we make a diagnosis of cancer. A tumor may be present in the stomach for a considerable time before it is palpable. If we teach the profession the early submission of their cases to an *x*-ray examination when suffering from dyspeptic symptoms, and to other methods of precision in diagnosis, we will relieve the practitioner of the opprobrium cast upon him.

In most cases of cancer pain is absent in the very early stages of the disease. In cancer of the stomach it appears earlier than in certain other portions of the body. This is because of its association with ulcer. If we see a patient with symptoms

indicative at all of ulcer, that patient should be thoroughly examined, and the general practitioner should be taught to make his diagnosis early and refer patients to a surgeon as soon as it is shown that medicinal measures will not relieve so that treatment can be carried out promptly. The practitioner, however, is not always responsible for delay. In the first place, the patient does not consult a physician for numerous dyspeptic symptoms until quite late in the course of the trouble. He should be taught by the practitioner to come early and to get a thorough examination. Most of the mistakes made are due largely to the fact that patients are not given careful attention.

Dr. W. P. Carr, Washington, D. C.—I am glad Dr. Smythe read this paper. I think it is an important one, and examination by the *x*-ray mentioned by Dr. Sherrill is certainly a great advantage. We have some excellent *x*-ray men in Washington, and they have been able to make diagnosis in several cases very positively of very early carcinoma of the stomach.

I want to mention briefly three cases that were sent me by a stomach specialist and *x*-ray man with diagnosis of ulcer of the stomach, but at the time of operation the ulcers were found rather indurated, and I did a resection of the pylorus, taking away about one-third of the stomach and about half an inch of the duodenum. These three cases on being examined microscopically turned out to be beginning carcinoma, evidently starting on the ulcer. They all recovered. One has gone three years, one two years, and one one year without recurrence. While these are only three cases, they add to the hopefulness of the picture if we can get them early and I believe if we can get an early diagnosis, it must be done through submitting these patients to a thorough *x*-ray examination early.

Dr. Smythe (closing).—It was not my purpose to cast any reflection upon the general practitioner but to simply state the plain facts in this case. The patient had been treated by the family physician and medical counsellors for twelve years for stomach trouble; for the relief of symptoms that were at least strongly suggestive of a chronic lesion of the stomach—not the reflex symptoms due to chronic appendicitis, or to disease of the gall-bladder, but symptoms so suggestive of a gastric lesion that any physician should interpret them correctly in a large per cent. of cases, if carefully studied.

The cancer in this case developed upon the border of the ulcer that in my opinion had undoubtedly existed for a period

of time—at least twelve years. The cancer was of very rapid growth after its development, producing intense pain and rapid loss of weight and strength, so much so that after a very few weeks he was forced to abandon his occupation. There is no evidence available to justify subjecting a case with such a history to medical and dietetic treatment as a curative measure.

My object in reporting this case is the hope that a further discussion of the subject will impress upon the physician who first sees such cases the wisdom of altering his bearings. Unless the family physician recognizes chronic gastric ulcer as a surgical lesion and refers the case to a surgeon the mortality statistics in cases of cancer of the stomach will remain very much the same in the future that it has been in the past.

I further wish to say that it is of the utmost importance that the surgeon himself make a thorough examination of his patient. A complete history of the case should always be obtained and followed up by a thorough physical examination of the patient in order that such errors in diagnosis may be minimized.

The *x*-ray examination is of value when conducted by a specially trained man in that line of work. Analysis of the contents of the stomach is likewise of value. The surgeon, however, depending upon those valuable aids to diagnosis and neglecting to thoroughly examine his patient will be embarrassed many times by the presence or absence of lesions at operation that should have been foretold more or less accurately.

It does not reflect very great credit upon us for a patient under treatment for symptoms referable to the stomach to make a diagnosis of cancer of the stomach in his own case upon accidentally discovering the tumor in the epigastrium.

THE USE OF FREE GRAFTS OF WHOLE THICKNESS SKIN FOR THE RELIEF OF CONTRACTURES

By John Staige Davis, M.D., F.A.C.S.
Baltimore, Maryland

The contractures to be considered in this paper are those following burns, injuries, and infections, in which the skin and often the subcutaneous tissue has been completely destroyed.*

Contractures have always been surgical "bug-bears," and many methods have been suggested and tried for their relief. Multiple incisions through the scar tissue, followed by the injection and inunction of fibrolysin, has been advocated, but my belief is that fibrolysin has little, if anything, to do with the occasional good result.

Plastic operations of various kinds have been tried with more or less success. The use of pedunculated flaps is especially valuable when a pad of fat is required in addition to the whole thickness of the skin, but this method should be used only in selected cases, as it has its limitations. In some instances pedunculated flaps from adjacent tissue are almost impossible to obtain, especially in finger contractures, and also when the contracture is in the midst

* No detailed case histories will be given in this report, but lantern slides will be demonstrated which give an idea of the cases I have studied. In addition to those shown, contractures in other situations have also been relieved by whole thickness grafts, but photographs were not available for lantern slides.

of scar tissue. It is usually easy to secure sufficient tissue by using flaps from distant parts, but the constrained position necessary in order to utilize these flaps is exceedingly irksome to the patient, and many are unwilling to endure the discomfort.

All the methods of skin grafting have been tried. The small, thin grafts of Reverdin and the larger grafts of Ollier-Thiersch are not, as a rule, effective, especially on exposed positions, such as the palmar surface of the hand, both on account of the danger of recontracture under the graft and also because of the instability of the result. "Small, deep grafts," while more resistant, are also unsatisfactory for the relief of contractures. The graft of whole thickness skin, on the other hand, furnishes a solution of the problem which I have found most satisfactory, and I thought it might be worth while to bring the subject to your attention.

Technic. *Preparation of the Area to Receive the Graft.* If possible the part should be thoroughly massaged for some time before operation, as in this way the surrounding tissues are made more movable, the blood supply is improved, and better results are accomplished. All of the scar tissue should be excised if this can be done with safety, but in many instances the entire part is covered with scar, and in these only the contracture should be entirely excised while the movable scar tissue beyond should be utilized. In contractures of the hand I have found it best at this stage to apply a splint, previously prepared and sterilized. This splint should be padded with thick felt and be so arranged that the fingers can be held in the desired degree of extension, either by loops of tape or by cotton glove fingers.

It is of the utmost importance that the raw surface on which the graft is placed be perfectly dry. It is often difficult to check the oozing, and in some instances in which

the bleeding cannot be stopped it is advisable to wait for a day or two before applying the graft. If the graft is placed on an oozing wound the chances are that a blood clot will form beneath it, and this will often seriously interfere with its new blood supply. If the graft is placed on a dry surface it has the tendency to prevent further oozing, and if any bleeding should subsequently begin, as, for instance, during postanesthetic nausea, it is usually localized in a comparatively small area, and can escape through the perforations in the graft or between the stitches.

Whole thickness grafts may also be successfully placed on undisturbed, healthy granulations which are level with the skin edges. The grafts should be placed close to the growing edge, and to each other if more than one is used. Whole thickness grafts placed on dry granulations will adhere to them closely, and no sutures may be necessary. Grafts placed on granulations at first project above the surrounding skin, but later assume the proper level.

Preparation of the Skin from Which the Graft is Taken. Shave the part selected and wash with green soap and water. Rinse with sterile water. Sponge with ether followed by alcohol. Then rinse with normal salt solution and dry with a sterile towel. From this point preserve an absolutely dry technic until the graft is in place.

Cutting and Placing the Graft. Mark out lightly with a scalpel on the skin an elongated ellipse, bearing in mind that the edges of the wound caused by removal of the graft should be approximated with but little tension. Remove the skin with the underlying fat down to the fascia or aponeurosis covering the muscle. As soon as the scalpel has penetrated the subcutaneous fat the skin immediately shrinks about two-thirds of its original size transversely, and a little less in its length, and this shrinkage must be planned for.

Wrap the graft in dry gauze until the wound from which

it is taken is sutured and dressed. Then trim off all the fat from the graft with curved scissors. Perforate the graft in several places to allow the escape of any blood or secretions which may collect. Fit the graft into the defect, either in one piece or in several pieces, depending on the shape of the wound. If one piece can be used it is advisable to secure it without tension by four cardinal sutures, preferably of horse-hair. In some instances a continuous horse-hair suture is used to fill in between the cardinal sutures and in others a few interrupted sutures. The cardinal sutures should be through the full thickness of the graft, but the sutures between should be superficially placed, and should be as close to the edges of the graft and surrounding skin as possible. Occasionally no sutures at all are used, as the graft adheres closely to the dry wound; but when no sutures are used it is advisable to secure the graft by means of rubberized mesh. A slight, even pressure should be exerted on the graft to hold it firmly against its base, but too much pressure should be avoided, as it interferes with the vitality of the graft.

The graft should be handled as little as possible, and the necessary handling should be most gentle. All of these points seem trivial, but on them depends the success or failure of this type of graft. A Thiersch graft may be handled with much less consideration and be successfully transplanted.

It is often advised in text-books to excise the scar tissue in one piece, and after excision to place it as a pattern on the skin and cut the graft by it; but this is not entirely practical, as the majority of scars are irregular in outline, and, furthermore, the scar itself shrinks after excision, and the graft after cutting shrinks, so little can be gained by this procedure. I consider it essential that the wound from which the graft is taken should be closed at once and not left open, as would necessarily follow if an irregular-

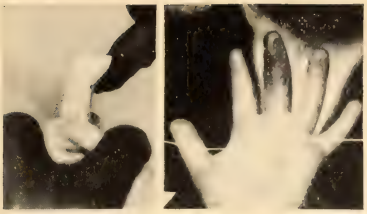

FIG. 1, *A*

FIG. 1, *B*

FIG. 1, *A*.—Contracture following burn. Duration nine months. 1, before operation; note limit of extension. 2, after grafting, note perfect extension.

FIG. 1, *B*.—Contracture following burn. Duration seven months. 1, before operation; note amount of extension of forefinger and scar in palm. 2, result of whole thickness grafting. The first grafting was unsuccessful. The second was completely successful. Note the whole thickness graft on forefinger and palm.

FIG. 2, *A*

FIG. 2, *B*

FIG. 2, *A*.—Bilateral contracture of both eyelids following burn. Duration seven years. The patient was unable to close her eyes. When sleeping the eyeballs were turned upward, but the lids were held apart by scar tissue on the forehead and cheeks. 1, before operation; showing the extent of closure of the eyelids. 2, result of whole thickness grafting, after twenty months. Note the closure of the eyelids.

FIG. 2, *B*.—Contracture following chronic ulcer and *x*-ray burn. Duration ten years. 1, shows ulcer and outline of scar which prevents flexion of thumb. 2, result of whole thickness grafting, after two and a half years. The function of the thumb is perfect.

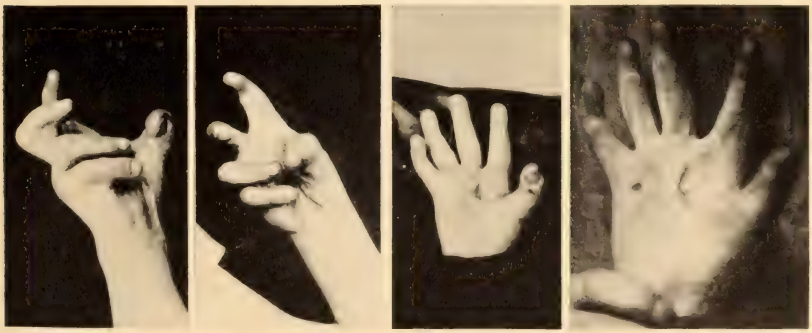

FIG. 3.—Contracture following burn. Duration four years. 1 and 2 (at left), before operation. The fingers are extended as much as possible. 3, eleven months after whole thickness grafting. 4, five years after grafting. The function of the hand is perfect. Note the grafts on the finger, thumb, and palm.

FIG. 4.—Contracture following a crush burn between hot rollers. Duration six months. 1 (at left), before operation. Note the limit of extension. 2 and 3, twenty-one months after whole thickness skin grafting. Note complete extension and flexion. The outline of the graft can be seen. Note slightly roughened and pigmentated skin. The patient, who is a printer, has been able to work at his trade without hindrance since discharge from the hospital.

FIG. 5.—Contracture following burn of back of hand. Duration four months. 1 (upper left), before operation. The extent of flexion due to contraction of scar tissue on back of hand. 2 (below) and 3 (upper right), taken two years later. Result of grafting. Note the size of the graft and the ability to flex the hand. The patient is a presser and has been able to use his iron since operation.

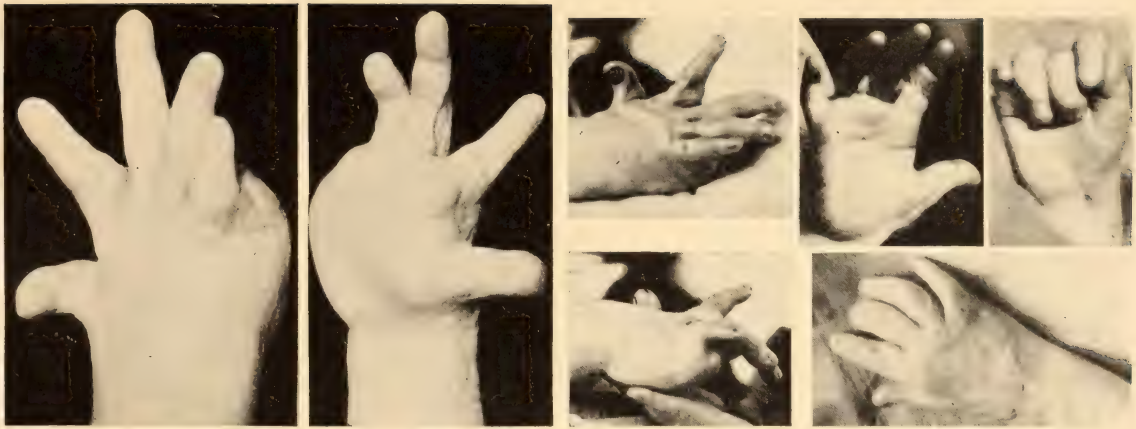

FIG. 6, *1* FIG. 6, *2* FIG. 6, *3* (above). FIG. 6, *4* (below). FIG. 6, *5* and *6* (above). FIG. 6, *7* (below).

FIG. 6.—Contracture following burn. Duration several months. *1* to *4*, cast and photographs of hand before operation. Note hyperextension of all fingers. *5* to *7*, taken twenty-two months after removal of contracture and transplantation of free grafts of whole thickness skin. Note large size of graft and that it is placed in the midst of scar tissue. Note the difference in flexion before and after operation. The little finger cannot be perfectly flexed, otherwise the patient can make a good fist and has a useful hand.

Fig. 7.—Contracture following electric burn. Duration ten months. (Case reported in Surgery, Gynecology and Obstetrics, November, 1907, p. 554.) 1 (upper left), condition of hand May 1, 1906, before grafting. 2 (upper right), taken eighteen months after grafting. 3 (lower left) and 4 (lower right), taken November 15, 1916, ten years six and a half months after grafting. The graft has been exposed to constant trauma incident to farm work. It has increased in size as the hand has grown larger, and has preserved its own characteristics. Hairs similar to those on the thigh, from which the graft was taken are growing on it. The graft is pigmented and wrinkled, but is soft and movable with the surrounding skin. The functional result is excellent.

shaped piece of skin of any considerable size were removed. It is advisable to have the size and shape of the defect in mind when cutting the graft, but it will be found that a piece of whole thickness skin after removal of the fat is very pliable and can be easily fitted into irregular defects. It is better to have the graft too large than too small, and if the defect is irregular the graft may after removal be cut into the desired shape or divided and pieced together. It is, of course, desirable to fill a defect with a single piece of skin, as there are fewer resulting scars; but this is often impossible.

Dressings. Silver-foil, dry gauze, moist salt gauze, which is kept wet or which is allowed to dry out, are all excellent dressings. Another dressing which I have found useful is a flexible paraffin mixture used by Carrel for another purpose:

Paraffin, 52°	18 gm.
Paraffin, 40°	6 gm.
Beeswax	2 gm.
Castor oil	1 c.c.

Mix. Sterilize in the autoclave and apply at body heat.

Any of these may be used with success, but none of them should be used exclusively, as the dressing should be chosen with regard to the surroundings of the wound grafted. For instance, it is more satisfactory to dress a graft used around the eye with moist salt gauze which is kept wet and often changed, as by this means the secretions from the eye are controlled, and there is less danger of infection, etc.

In children under ten years of age, in addition to the splint in hand and arm contractures, I find that it is always wise to put up the part in a plaster cast. If there are no contra-indications I do not disturb this cast for at least three weeks, and at the end of this period it will be found that either the graft has taken or, in case of failure, the

process of healing has proceeded with the part in good position. So in either case no time is lost. Another reason for keeping the cast on so long is that it is almost impossible to keep the part in the original position after once removing the dressing. This method of dressing children also insures immobilization, which is most important.

Except in young children, where plaster casts are indicated, it is well to keep the grafted area under constant observation without disturbing the position of the part, which should be kept immobile until the blood supply is assured.

Anesthetic. A general anesthetic is usually necessary in order to remove the contracture and to prepare the wound for the graft. Advantage is always taken of this anesthetic to cut the graft, but whole thickness grafts may be easily secured and successfully transplanted after nerve blocking, or after outlining the area with a local anesthetic.

Early Changes. In whole thickness grafts there may be practically no maceration of the superficial layers, while in some instances, on the other hand, only the corium may remain viable. Now and then an isolated section of a graft will lose its vitality through all its layers and a patch of granulation tissue will appear. This area should be treated as any other granulating wound.

When the superficial layers are macerated and come away, either as a whole or in part, and the epitheliation of the remaining corium is sluggish, it is desirable to scatter over these areas either epithelial scrapings or small superficial grafts containing, as far as possible, only epithelium. These grafts take readily and hasten the epitheliation. The final result is excellent.

Subsequent Changes. The result desired in whole thickness grafting is elasticity, softness, movability, and normal color. Krause says that all of these are obtained in a third of full takes, although the same technic is used in all. In

some instances a brown, irregular pigmentation may appear, but this is no more frequent than in areas grafted with thin grafts, so need not be particularly considered in cases of contracture in which function is more important than appearance. The graft may be cyanotic for some time, due to enlarged bloodvessels; later the surface of a graft may become irregularly shriveled. These changes in no way impair the efficacy of the graft, but must be borne in mind from the cosmetic standpoint, and the possibility of these complications explained to the patient.

Histological Changes. The histological changes in the healing process of a whole thickness graft are, in general, similar to those which take place in the healing of an ordinary clean wound. There is an exudation of fibrin from the surface upon which the graft is placed, which fixes the graft firmly in position. This fibrin layer is infiltrated by leukocytes and fibroblasts, and vascular sprouts soon begin to form and penetrate the corium, so that in a comparatively short time the graft is supplied with blood. These new vessels have been demonstrated by the injection method in whole thickness grafts on the third day. As early as the sixth day a whole thickness graft on a fresh wound will bleed when cut. I have obtained bleeding in eighty-four hours from a whole thickness graft placed on healthy, undisturbed granulations. The graft itself begins to take an active part in the healing process after the third or fourth day, there being marked proliferation of cells into the underlying exudation and an outgrowth of new epithelial cells from the edges, from the ducts of the sweat glands, and from hair follicles. The elastic tissue of the graft degenerates and is replaced by newly formed tissue, which probably develops, at least in part, from the preëxisting elements in the graft itself as well as from the old fibers in the neighboring deeper tissues. A thin layer of adipose tissue develops, under whole thickness grafts denuded of

fat, in between two and three weeks. This is most important, as it prevents to a large extent future contracture and insures movability. The scar tissue beneath the graft continues to grow for several months. The newly grafted area must not be exposed too soon to irritation or trauma. It is difficult to guard against this until the nerve supply is reëstablished, as for the first few weeks the graft is without sensation. Within four or five weeks sensation begins to be restored to the transplanted skin, which gains tactile sensibility first, then pain, and last temperature sense. The nerve fibers undoubtedly grow in from the periphery and not from the substratum, this being shown by the border sections always regaining sensation first. If the graft is large the central portion may, in some cases, remain less sensitive for a long time, but usually the sensation is entirely restored in the course of a few months.

Iso and Zoö Grafts. While only autografts have been used in this group of cases, I feel that it will not be out of place to make a short note concerning isografts and zoögrafts.

There is much difference of opinion as to the advisability of utilizing isografts, and many surgeons insist that only autografts should be used. Of course, autografts are more likely to succeed, but I feel convinced that when it is not possible to utilize autografts that isografts are well worth trying, and that very good, lasting results may be secured if the grafts are obtained and transplanted with the proper technic.

The success or failure of isografts may be dependent on the similarity of blood groups of the host and donor, and a subsequent report will be made on this point.

Many successes have been reported following the use of zoögrafts from various animals. My own experience is that these grafts take readily and receive their blood supply as promptly as ordinary grafts. They also have the power

of stimulating epithelial growth from the edges when placed on granulating wounds, as do other grafts. However, in every case which has been under my observation these grafts after doing well, and often when the wound is entirely healed, will suddenly, with no apparent cause, begin to melt away, and will soon disappear.

Transplantation of Hair-bearing Skin. In those cases of contracture in which the eyebrow has been destroyed, carefully shaped whole thickness grafts of hairy skin from the pubis, with a thin layer of subcutaneous tissue, may be successfully transplanted, and will relieve the contracture and at the same time form an eyebrow. In transplantation of skin from the pubis the direction of the hair growth should be kept in mind. Hair also grows on grafts taken from the thigh or from any other hairy region. For this reason it is important to choose carefully the region from which the graft is taken in regard to the area into which it is to be transplanted.

Remarks. In spite of various "best methods" of healing wounds, and even in the hands of careful surgeons, contractures do sometimes occur and always will continue to occur.

Contractures are more likely to follow in those cases which heal by granulation because of the greater amount of connective tissue formed in the slow-healing process. They are much less likely to occur in cases in which the healing is properly assisted by skin grafting or plastic operations.

Contractures are caused by the formation and subsequent shrinkage of scar tissue which replaces the skin and subcutaneous tissue.

Contractures following burns have been most frequent in my series of cases, and then following infection and injury in the order named. I have also had a few cases of congenital contractures of the fingers. The majority of

contractures have been on the flexor side. In some cases of long standing there has been subluxation of joints, which complicates the treatment.

In cases in which the destruction has been deep it may be necessary to lengthen the tendons in order to obtain extension, and in one or two cases showing subluxation, osteotomy also has been necessary.

When contracture of an eyelid is dealt with it is seldom possible to remove all the scar, but, as in other situations, all tension can be relieved. It is advisable to markedly overcorrect in relieving these deformities, as the subsequent shrinkage of the scar and wrinkling and folding of the skin in this situation have to be taken into consideration.

The skin may be taken from almost any situation where there is sufficient laxity of tissue to admit the suturing of the edges of the wound from which the graft is taken.

Grafts may be cut the whole length of the thigh and from as wide an area as can be sutured. By using a boomerang-shaped incision a very long and wide area of skin may be secured from the abdominal and chest walls.

Often we find after removing a whole thickness graft that large veins which have not been cut are exposed. It is better to excise these veins, for if this is not done there is quite often after closure a thrombosis of the vein without infection, but with subsequent pain and discomfort.

A graft of whole thickness may be placed successfully in the midst of scar tissue and accomplish its purpose. The result in these cases being that the graft is more stable than the tissue which surrounds it, and it also follows that the scar becomes more resistant as the tension is relieved.

Gentle massage of the grafted area should be started several weeks after operation, and the manipulation be gradually increased until the graft moves freely with the surrounding skin.

Whole thickness grafts are used comparatively infrequently for the relief of contractures, and many surgeons have never used them, preferring to take a chance with the thin grafts.

The operative procedure in securing thick grafts is undoubtedly much greater than in securing thin grafts, and occasionally the after-care is difficult and tedious, but, on the other hand, the healing following a successful whole thickness graft is as stable and firm and pliable as the original skin. I believe that the ultimate result will more than justify the time taken as well as the discomfort experienced by the patient.

Conclusion. Contractures causing complete or partial loss of function and accompanied by hideous and crippling deformities may be relieved by the use of free grafts of whole thickness skin and the part restored to its former usefulness.

DISCUSSION

Dr. Alexius McGlannan, Baltimore.—I wish to say a word of approval of the very excellent work of Dr. Davis and to mention a case in which I am personally indebted to him for helping me out in the case of an extremely difficult burn, where his very excellent work has restored a child to a useful life.

This child was admitted to the Mercy Hospital some years ago with the end results of an extensive burn. There was an ulcer, with contracture and other distressing conditions that go with such burns. I attempted to the best of my ability to care for the child and to make it comfortable and failed. The family naturally were very much disturbed at our repeated failures to restore the child to health and function. On account of the very disagreeable condition of the wound, it did not seem fair to ask Dr. Davis to come to a strange hospital and attempt so difficult an undertaking. With the consent of the family physician the patient was admitted to the hospital with which he is connected, and to my great delight, about a year afterward the child had the function of the limbs restored, and was covered with epidermis, Dr. Davis thereby accomplishing what seemed to us almost a physical impossibility.

Dr. William R. Jackson, Mobile, Alabama.—I would like to ask Dr. Davis how he would deal with a contracture in the popliteal space following a burn, or in the flexor of the forearm, particularly a large contracture with a web two or three inches wide from the popliteus to the free margin of the web and what kind of graft would he use?

Dr. George A. Hendon, Louisville, Kentucky.—In this connection I would like to relate an experience I had with a child who was extensively burned on both legs, the burns extending from the groin down to the malleoli, the entire surface of the skin being destroyed. I saw the child three or four weeks after the accident had occurred. The child was three years of age. Both thighs were forcibly flexed upon the abdomen and the legs on the thighs.

Under an anesthetic we straightened the legs out and tried the use of some skin grafts which were supplied by a brother and the stepfather of the child. The skin grafts from the brother, and those from the stepfather were placed upon separate legs to see whether the difference in relationship would influence the destiny of the grafts. However, no discrimination appeared. Those taken from the stepfather grew as well as those taken from the brother. The burned area was very extensive, so that these grafts were only used with the idea of furnishing foci of proliferation, and with the wide divergence between the extent of the area and the amount of grafts used, the result did not seem to be at all promising. In this emergency Dr. Sherrill came to my relief by performing upon another patient an amputation and supplied us with all the skin the patient required. We covered the two legs of the child with the full thickness of skin obtained from the limb amputated by Dr. Sherrill. These grafts were cut into strips and laid over the denuded area, and covered the grafts with strips of rubber tissue and with poultry wire made a cage for the limbs. This wire was retained in place by snugly applied bandages and both legs kept under a constant drip of normal salt solution. The results were almost ideal. Only one or two of the grafts failed to take. In two months from the time of the operation the child was able to walk perfectly and without any contracture.

One other little experience that is not so happy occurred as follows: An operation for contractures that were sustained by a machinery injury resulting in the loss of the use of the

right hand. In that case we lengthened the tendons and covered the raw surfaces with grafts as described by Dr. Davis, with recovery. But this boy, I learned a few months after he left the hospital, was arrested in an adjoining town in the state and the charge against him was that of a pickpocket.

Dr. Lomax Gwathmey, Norfolk, Virginia.—I would like to ask Mr. Davis two questions. First, as to the determination of the degree of cleanliness upon which the grafts will take, and whether he has devised any method of positively knowing whether hetero-grafts will take. Our experience has been frequently that hetero-grafts will take well and subsequently die.

Dr. A. A. Law, Minneapolis, Minnesota.—I have some temerity in discussing this paper because I heard only the last part of it. However, in Minnesota we have watched Dr. Davis' work with a great deal of interest, and our work in some measure parallels the work done in his clinic.

We have been greatly impressed with the facility with which we can transplant pedicled whole skin grafts, homografts of course, in the correction of deformities secondary to burns the results have been particularly gratifying.

I was interested in the last of the paper in which the author spoke of hair growing from a whole skin graft. One of the most illuminating examples of this phase of the subject occurred in the case of a woman in whom there was complete avulsion of the scalp. The scalp was torn away by revolving machinery, and the extensive area left was grafted after the method suggested by an itinerant French frontier surgeon, who used it many years ago, during the days of the Indian wars. It was later reported in a Philadelphia Journal in the early part of the 18th century.

The method consisted of drilling holes through the outer tables of the skull until the diploe was invaded; at the end of three weeks little mushrooms of granulation tissue sprouted up from these holes and finally coalesced to make a scalp of granulation tissue, upon which one could skin graft. We restored the scalp *in toto* by this method and she wore a wig made from her own hair.

At the time of her scalp avulsion she lost her right eyebrow. As the scalp was entirely gone, we sought hair bearing skin to graft from for this eyebrow and the only place we could find

enough hairy growth was on the mons veneris. We transplanted a free graft from the mons veneris, and to our great surprise the majority of its hair lived, and while it grew in every direction, by judicious training, plenty of vasoline and a dark pencil she has a very good looking eyebrow at the present time. (Laughter.)

There are one or two practical points I desire to call your attention to in the whole skin grafts, one of which is light scarification by a knife to relieve the lymphedema in these grafts. Nutrition, of course, in these grafts is from the plasma until such time as vascularization is reëstablished. As a measure of insuring the viability, a suture is placed through the middle of the grafts maintains coaptation between the graft and the underlying tissues.

I have been interested in my work, as other men have, in the skin homograft situation. One clinic reports 60 per cent. of all takes, yet according to the reports of another clinic, they never take.

In the University clinic, we get practically 50 per cent. to all intents and purposes, of clinical takes; in any event, the clinical result obtained is identical with those seen from the use of autografts.

Dr. J. M. T. Finney, Baltimore.—I have followed many of these cases of Dr. Davis and the ultimate results are satisfactory. Of course, Dr. Davis is dealing with those cases where contracture is the thing to be relieved. In the ordinary case where skin grafting is necessary, as in cancer of the breast, the use of the Thiersch graft is well established, as is also the Reverdin graft which in suitable cases gives good results.

In the class of case reported, the whole thickness graft is the only one to be considered, as Dr. Davis suggests.

I once made a new nose for a man, and in so doing used a finger to make the bridge of the nose, and in doing this I thought that I had completely destroyed the matrix of the nail. The result was fairly satisfactory, for some time after in reply to a question as to how he liked the result, he replied, "Fine, doctor." "I can get into a street car now and nobody looks at me," a pretty good commentary as to the character of the result. About that time he told me that while his nose was all right, there was something "funny" growing between his eyes. There was something there that "looked like a little horn." I looked and found that a piece of finger nail protruded between his

eyes. He told me that whenever he cut his finger nails he had to cut the one between his eyes. (Laughter.)

Dr. Davis (closing).—I am sorry that I was not able to read more of my paper because of the limited time, as many of the questions asked in the discussion are fully considered in it. In these contractures the wound on which you put your graft is a fresh wound which follows the removal of scar tissue.

I have never tried any method of determining the number of bacteria in a certain granulating area, but simply judge the condition from the appearance of the surface. I wish to emphasize the fact that a perfectly dry technic should be used throughout. Do not put the graft in salt solution. If after removing the fat from the graft it is necessary to check the oozing from the wound to be covered, take the fat and put it back on the graft, so that the graft will not dry out.

When dealing with contractures in the cubital and popliteal spaces, it is advisable when possible to shift in pedunculated flaps of skin and fat, but I have had a number of these cases in which whole thickness grafts have been effective. In some of these, after excision of the scar, too large a defect is left to be covered with whole thickness skin. In such defects a suitable graft of whole thickness skin should be placed over the selected portion, and the rest of the uncovered area filled in with Thiersch grafts.

It is essential that the wound be perfectly dry, as many failures are due to the formation of a blood-clot beneath the graft.

Dr. Martin.—How do you determine the size of the graft?

Dr. Davis.—Largely by experience. I think it is important to close the area from which you take the graft. If you do not, you leave an unnecessary lesion.

Dr. Martin.—Do you get the same results if you stretch it?

Dr. Davis.—No. You should not put too much tension on the graft, but should endeavor to have it about the tightness of the normal skin.

As to iso-grafts, I reported a number of cases when I reviewed the subject of skin grafting at the Johns Hopkins Hospital. There were some 40 cases in the series. I took my results from the history reports, but do not now believe that the percentage of permanent takes was as large as it appeared on paper. However, I still feel that they are well worth using.

In a great many cases of skin grafting I have never observed the anaphylactic symptoms that have been occasionally reported. Two or three cases of anaphylaxis have also been reported in the literature following the use of iso-grafts.

The slides you have seen today demonstrated the successful use of free grafts of whole thickness skin for the relief of contractures. There is no reason why practically all such deformities cannot be corrected by this means, although now and then, in case of failure, it is necessary to graft again.

POSTOPERATIVE CARE OF PROSTATIC CASES

By Wm. Stokes Goldsmith, M.D.
Atlanta, Ga.

The review of the literature on surgery of the prostate reveals many interesting questions relating to the various methods employed in this valued operation.

The enucleation of a diseased prostate has an established place in modern surgery as firmly fixed as its contemporary, the diseased thyroid, and it is a matter of note that the development of the surgical treatment of these two widely separated glands closely parallel each other.

The same doubts, the same mistakes, and finally the same successes were obtained by the elimination of unsound theories and the acceptance of the sound practice of exhaustive study and ripe experience.

It is therefore a fact of common knowledge that the mortality of these operations is growing less each year; and the cause for this lessened death-rate is also clear, namely, the intelligent scrutiny of each case from every angle and the scrupulous selection of such cases as may be submitted to radical operation.

There cannot exist any points of controversy in the underlying principle of prostatectomy, but, as above stated, the preliminary treatment, routes, drainage, and the general postoperative care are matters of serious significance, and about which the profession is far from being a unit.

The preponderance of the literature reviewed was devoted to technic and preoperative preparation. There can be no

other word than praise for these timely contributions, but the writer was impressed with the casual and practically neglected discussion of the patient's welfare upon leaving the operating room.

It is my experience that there is no condition following a surgical operation which demands such unremitting personal attention as a prostatectomy; and if the surgeon does not possess assistants, specially trained and enthusiatically co-operative, he must lavish much of his time and attention, even to minute details, or else many otherwise avoidable complications will befall him.

The average interne will not do this work well, but fortunately in nearly every hospital one young man is attracted to these cases, and to him we must depend as a faithful co-worker.

In my part of the country the orderlies are only required to minister to the grosser necessities of the patients, and the limit of their professional attainment is the questionable comfort of administering an enema.

In a number of cases very satisfactory assistance was rendered by trained nurses (female), and their kindly aid is always gratefully acknowledged. The age of these patients and their distressing infirmity absolves the nurse from any question of propriety.

The nurses duty, aside from the ordinary routine attention, is to change the dressings and keep the patient's linen and bed-clothing dry and free of the urinary odor. These are suprapubic operations, and the interne performs the irrigations and attends to all phases of drainage and such other matters improper for the nurse to undertake.

The choice as to route of operation will not be discussed here, neither will that large controversial subject of retention catheter versus two-step operation, nor will the functional test-point be raised.

It is assumed that all reasonable preliminary precau-

tions have been observed and that all schemes of procedure harmonize. The essentials in this postoperative treatment are summed up in this manner: (1) drainage and irrigations; (2) renal activity; (3) posture and general observation following active convalescence.

Drainage. There is a wide difference of opinion regarding the methods of draining the bladder. Some operators use a tube the size of a garden hose; others pack the prostate wound with gauze strips for hemostasis and drainage; while others employ a retention catheter, with complete closure of bladder, in suitable cases.

To my mind there is no necessity for the use of large drainage tubes, since a small tube is effective and inflicts much less trauma on the bladder mucosa and the overlying abdominal wall.

Another point, in this connection, is the disregard of the trauma of the bladder and abdominal tissues incident to the enucleation of the gland. The great difficulty sustained in the separation of the prostate from the capsule frequently involves strenuous finger dissection, which means rather prolonged pressure of the disengaged portion of the hand.

The surgeon with short fingers operating upon a fat patient will readily appreciate this situation. Personally, my plan of drainage is that suggested by Stuart McGuire, consisting of a large size soft-rubber catheter, carried through the urethra and protruding through the suprapubic wound.

Several holes are made in the catheter approximately in the prostatic area. The distal end of the catheter is cut off and clamped with small forceps, or other device, which is covered with the dressings.

This plan affords a two-way medium of drainage and irrigation. After four or five days this catheter is removed and a new and perhaps smaller catheter is passed

through the urethra and retained. The small bladder and abdominal wounds at once begin to close, and convalescence usually is hastened thereby materially.

In three recent cases, clean bladders and one-step operation, the bladder was tightly closed, as well as the suprapubic structures, save for a small cigarette drain in the space of Retzius. In two immediate repair occurred, and the third leaked slightly for a few days, owing to catheter trouble caused by the patient's interference.

Troublesome hemorrhage is controlled by packing iodoform gauze strips, saturated with adrenalin solution, and the presence of this gauze does not interfere with the through-and-through drain, as the wound is afterward closed snugly up to the catheter by the insertion of several silkworm-gut sutures, which are left untied while the gauze is in the bladder.

The inflated rubber bag devised by Hagner is an ingenious and useful instrument, but as yet I have had no occasion to use it. I cannot but feel that in many cases prolonged hemorrhage is caused by irrigations.

As a matter of fact, our efforts to check bleeding by running continuous or intermittent streams of water into the wound cavity serves to wash out clots and reopens vessels which would cease oozing if left alone.

It is also my conviction that frequent irrigation in the so-called septic cases for the first forty-eight to seventy-two hours after operation results in much harm on account of the inability of the tissues to firmly protect themselves and the liability of increasing absorption by tissue irritation.

The use of an ounce or two of normal saline solution gently passed through the catheter, to rid it of clots, is the only instruction given my interne with reference to this subject.

The activity of renal secretion is the one dominant point

in prostatic surgery. In my early work four cases of complete suppression, with fatal issue, forced the conclusion that the operative technic was a mere incident and that something more must be done in the matter of preparation than the perfunctory use of the catheter and bladder irrigation.

The recognition of the work of the pioneers in this line was substantial proof of the wisdom of accepting this thorough and conservative habit of dealing with these cases.

The question as to the quantity of water to be drunk is governed by the output and comfort of the individual. Some patients balk at forced drinking of fluids, and this objection is largely overcome by the selection of one of the so-called lithia waters.

The use of bicarbonate of soda in solution by mouth and combined with normal saline solution, as an enema, even preceding the operation, is continued after operation for an indefinite period.

The marked increase in quantity and quality of urine is striking, and whether or not we accept Fischer's theories, the fact remains that in all operations involving the genito-urinary tract, as well as many others in general surgery, the renal function is undoubtedly favorably influenced by the administration of the soda solution, and the patient is able to tide over a critical period in convalescence.

There is still another phase regarding the general management of these cases about which some difference of opinion exists, and that is posture. We all know the dread of postural hypostosis in the aged and middle-aged person.

The lurking dangers of chest and renal complications, due to posture and an esthetic irritation, has forced us in the past to use every endeavor to get these old men up in bed and out of bed in three, four, or five days.

In isolated cases this may be good practice, but in the

majority of cases there are any number of good reasons why we should not abruptly elevate their bodies or too suddenly have them turn from side to side.

Sudden death has occurred as the result of this unprepared postural change. The heart, lungs, and brain must have the increased burden thrust slowly and gently upon them, and even then the mental and physical strain seems to prolong the tendency to produce a condition of shock not seen in much younger subjects.

It must be kept in mind that these old men are debilitated; that practically all of their organs are crippled, functionally and structurally, and that the necessity of wholesome medicinal treatment along these lines is probably of greater value in working out a successful issue than the more intricate operative requirements.

DISCUSSION

Dr. J. Shelton Horsley, Richmond, Virginia.—In the type of work under discussion I agree most heartily with Dr. Goldsmith in regard to controlling hemorrhage. At one time it was considered necessary to use irrigation after every prostatectomy to control hemorrhage. Whatever may be the advantages of warm water in promoting secretion of the kidney, it certainly does not control hemorrhage by promoting clotting. The only possible advantage it may have is in contracting some of the vessels. Clotting is formed by the action of fibrinogen and fibrin ferment, and the latter is formed from destroyed cells. Water leaches out the fibrin ferment as fast as it is formed and counteracts advantage of the constriction of the vessels that any excessive heat may have.

Dr. Francis R. Hagner, Washington, D. C.—I have enjoyed Dr. Goldsmith's paper very much indeed. It is a very timely contribution, because I believe the successes we have had in prostatic work have been due very largely to the preoperative and postoperative care that these patients got.

There is as much difference of opinion about the treatment of these cases as there is in the treatment of cancer of the uterus

by gynecologists, or compound fractures by surgeons. We have certain methods of treating cases, and when we get good results from these methods, we stick to them. We do not like to make a change.

Some of the prominent surgeons doing genito-urinary work in this country say there is no need bothering about the control of hemorrhage. Many of these old men are in a bad physical condition. They are weakened; their hearts are diseased, and their whole organism is more or less impaired, so I believe it is very important to prevent hemorrhage in these cases, and feel sure it tends to lessen mortality of the operation.

The bag the essayist spoke of I have used in every case operated on. We have had in the following series 62 cases in the last twenty-three months. The youngest was fifty-eight years of age and the oldest was eighty-nine. These patients were treated from one to three weeks before we operate on them, but they are not selected cases. Of the 62 cases, we have lost but one. They were all suprapubic prostatectomies. It was thought at one time that the danger of suprapubic prostatectomy was greater than the perineal, but nearly all these cases were subjected to the two-stage operation, and I believe, if it is done in this way, with careful preoperative care, the danger is no greater. There is no question that the functional end results are much better by the suprapubic than by the perineal route.

One of the most important things in the postoperative care of these cases is water. We should make these patients drink; fill them up with water; make them pass urine. Dr. Squier, of New York, has been administering every four hours a grain and a half hypodermically of sodium benzoate of caffein. There is no question but that it causes active secretion from the kidney. It is given from twenty-four to forty-eight hours.

Another important thing is watching the reaction of the urine in these cases. If possible, get the urine acid before operation, and have the nurse every day or twice a day test the urine to see whether it is acid or alkaline. If it becomes alkaline, wash the bladder out with sterile water, following with the Bulgarian bacillus in tablet form, and the administration of ten grains of sodium phosphate two or three times a day.

We believe in irrigation. It should be started within six hours after operation, we have this done by the nurse three or four times daily, sterile water or salt solution is used. I know of nothing more important than the service of the nurse in these

cases. She is more important than the surgeon, and we are fortunate in having one or two nurses who are well trained in this work and who take care of these cases.

In this series of 62 cases, there were two that had postoperative hemorrhage, one twelve days after operation, and one fourteen days. One man was eighty-nine years old; he bled profusely, but by the time I reached the hospital the hemorrhage had stopped. The clots were washed out and there was no more bleeding. My assistant stayed in the hospital, and at 7 o'clock he had another hemorrhage. The bag was put in place and hemorrhage ceased at once. The other case had a similar experience. As soon as pressure from the bag was laid on the neck of the bladder, hemorrhage instantly stopped. Both of these patients had very advanced arteriosclerosis, which may have a bearing as an etiological factor.

Dr. John B. Deaver, Philadelphia, Pennsylvania.—I see a number of these cases and am glad to say that the distinguished Dr. Clark is not only a first-class gynecologist but an equally good prostatic surgeon. I will give the import of this remark in a moment.

I agree with Dr. Goldsmith and also with Dr. Hagner that the mortality is growing less each year. There is no class of cases that require more unremitting care than these prostatic cases, and in my experience the best nurse is the woman nurse, who knows not only how to handle these cases, but particularly the nurse who knows how to hold the hands of the patient and give him confidence. I only select a good-looking girl for this purpose (laughter), as I think it has much to do with the rapid recovery of the patient.

I want to say a word or two with reference to the three periods in a surgical case: the period before, the period during, and the period after the operation. The period during is the mechanical part, the less important of the three periods, the surgeon being a good mechanician.

As to the question of renal function which the essayist brought out, I now make it a practice to examine the blood, make a urea test in every instance as well as the phenolsulphonephthalein test.

A cystoscopic examination of the bladder and ureters I think important, at which time a hypodermic injection of indigocarmin is given and the effects observed.

A patient was sent to me recently for the removal of the

prostate. His blood-pressure was taken, and all these little stunts gone through with, as we wanted to learn all we could about that particular individual. After making the tests I said to the doctor who brought him, to take him home as he was a very poor operative risk. The next day he went into uremia and died. In this connection I am reminded of a case I saw in connection with Dr. Clark, who brought one of our distinguished patients through an attack of uremia after he had been practically dead for three hours; therefore he is a good prostatic surgeon. I want to say, furthermore, that owing to Dr. Clark this man has gone on beautifully for four years. He wears a soft catheter and is one of the most active men in this country. He does everything and remains perfectly well. He is a man approaching eighty. We did not operate on him because he had an attack of uremia from retention and because the specific gravity of the urine was 1001. I said to his doctor that as sure as fate if you operate on that man with a persistent specific gravity of 1001 you will lose him. He is a valuable man. He is better off living with a catheter than dead with his prostate out.

As to the question of hemorrhage, I do not give it a thought. I always say to my students, gentlemen, I am master of the situation. I always teach my house doctors that the patient must never leave the operating table until we are satisfied.

Relative to the question of hemorrhage, if there is any doubt at all, I invariably put a purse-string around the mouth of the prostatic bed; pack the prostatic bed with gauze, tie the purse-string suture tightly and bring the free end of gauze out of the suprapubic opening; knowing that I will sleep all night and the telephone will not ring. I leave the gauze until it practically comes away of its own accord which is, in the average case, the fifth or sixth day. If there is postoperative hemorrhage, the patient is taken to the operating room, is re-anesthetized, the bladder retracted and the prostatic bed repacked; but this should not have to be done if proper care is given at the time of operation. As soon as the patient is taken from the operating room he is given hypodermoclysis, a 1000 c.c. of normal salt solution, and when placed in bed is put on Murphy treatment and given all the water he can drink. We watch his blood-pressure, and if it is high, give nitroglycerin. If the blood-pressure is low we may give digitalis. In a few cases we give nitroglycerin and digitalis with spartein and caffein.

A most important point in connection with these cases which Dr. Hagner has brought out is the two-stage operation. Formerly I had more mortality when I did the one stage operation. Now it is the exception to have a death from this operation if the patient has had a two-stage operation.

Recently I operated on one of my brothers who had a bad bladder. I first did a suprapubic drainage. At the end of two weeks I took out the prostate; he went home in two weeks practically well. Formerly I would have done the operation at one sitting.

I am sorry Dr. Young is not here as I would like to discuss the supra- versus the infrapubic operation. Dr. Hunter McGuire the distinguished father of Dr. Stuart McGuire, in a discussion before the American Surgical Association a number of years ago, described an excellent operation for making a suprapubic fistula, when Dr. Agnew said he could not see the philosophy of going to the top of the house and breaking through the roof when he could break through the cellar door. Dr. Young is breaking in through the cellar door.

Dr. Francis Reder, St. Louis, Missouri.—As to post-operative bleeding in prostatic cases, I feel very much like Dr. Deaver about how the work is to be done. One of the annoying sequelæ of a suprapubic prostatectomy is not exactly a profuse bleeding, but an obstinate bleeding, a bleeding that seems to defy the usual hemostatic measures.

In dealing with such a condition the following method of procedure has served me well: At first I may mention that it is always well to take good care of the bladder mucosa during the enucleation of the enlarged prostate gland.

We do not know when this curtain of mucosa may be used to good advantage in just such cases of bleeding.

For the vesical drainage I use a tube of large caliber, preferably $\frac{3}{4}$ of an inch in diameter. The tube is about 5 inches long. Through this tube are drawn two silk ligatures. To each of the silk ligatures is attached a strip of gauze which is used to tampon the cavity caused by the removal of the prostate.

In tamponing, the curtain of the bladder mucosa is first carefully pressed into the cavity and then the cavity is gently packed with the gauze strips.

The ends of the silk ligatures are hanging free outside of the drainage tube when the connection is made with a glass "knee" similar to a Paul's tube, to drain off the fluid in the bladder.

If in forty-eight or seventy-two hours the gauze tampon is to be removed, all that is necessary is to disconnect the drainage tube without the least disturbance to the bladder wound from the glass "knee," make traction on the silk ligatures and in this manner remove the gauze strips which acted as a tampon, through the drainage tube. After the gauze has been withdrawn the tube is again connected. The method has, as a measure of safety, proved very satisfactory.

Dr. Crowell, Charlotte, North Carolina.—Like Dr. Deaver, I am not very nervous about hemorrhage immediately after operation in these prostatic cases. I certainly do not worry about hemorrhage three or four days later on account of the removal of tubes, etc. I don't use them. I do the perineal operation and never had severe hemorrhage following the removal of gauze from the capsule, or catheter from the bladder.

I am sorry Dr. Young is not here. He has drawings, and probably would have had them with him, that I would have liked to call attention to in my discussion.

Some time since I was doing a seminal vesiculectomy for tuberculosis of the right seminal vesicle and used Dr. Young's long tractor to bring the vesicle down into the operative field. During the operation it occurred to me that it would be very simple and easy to remove the prostate by splitting the capsule and peeling the glandular tissue out without making an opening into the urethra or getting into the bladder. Since that time I have done three of these operations successfully, one of whom is still in the hospital. He has voided all of his urine through the urethra since the operation one week ago and has gotten along unusually well. In fact all of these patients have gotten along quite well. I believe this operation only applicable in lateral lobe enlargements.

I have designed and am having made a tractor to be used as a guide in the urethra as well as tractor, which will enable one to bring the gland, suitable for this operation, well into view. This instrument was designed primarily for vesiculectomies and prostatectomies but can be used to great advantage in suitable cases for removing the gland in this way. If you can remove the gland in this way and pack the capsule with gauze, there will certainly be no danger of hemorrhage following the operation.

Dr. Goldsmith (closing).—I feel very much gratified as to the discussion over this question of drainage. I am sure, we

are all in accord as to drainage, but I am a little disappointed that this matter was not gone into more thoroughly.

As to the two-stage operation, there is no question on the part of those who do the suprapubic operation as to the enormous value of a preliminary suprapubic operation. It is one I do very frequently under local anesthesia. We have an abundance of time to get out the gland.

Drainage is the first thing. Those who see large drainage tubes put into bladders when they go into the ward are struck with the disagreeable odor and with the unsightly condition of things. We can drain and keep the patient so much better by the method I have described. I do not care what sort of dressing you put on, there will be more or less leakage from the use of large drainage tubes and you have a disagreeable odor and consequent distress of the patient.

THE CHOICE OF OPERATIVE PROCEDURE IN CANCER OF THE RECTUM AND PELVIC COLON

By Charles H. Mayo, M.D.
Rochester, Minnesota

One of the most serious as well as one of the most interesting surgical problems is the choice of methods in dealing with cancer of the rectum. It is serious because when unrelieved the disease leads surely to slow death, usually accompanied by much suffering. It is interesting because so many considerations are involved which influence the decision as to whether any operation is indicated, either palliative or radical, and if so what. The first of these considerations is the location of the area involved by the cancer and the forms of the metastases; the second is the extent of the local disease and the associated local or general disease. Obesity increases the risk. The decision as to a palliative or radical operation will be influenced also by freedom from contact dissemination or grafts at a distance within the abdomen.

The intelligent patient usually inquires whether there is any other way of treating the disease than by surgery. If not, he wishes to know the operative risk and the prospects of cure; whether he will retain control of his bowels and whether the new opening will be behind or in front? In regard to other methods of treatment: the use of radium is making great strides in the treatment of cancer, but at

the present time it is limited to particular cases of local involvement or to inoperable conditions. Radium treatment can hardly be classified in elective cases as being in any way in competition with the surgical treatment of cancer of the rectum except for epithelioma of the anus.

Operability. Operability is a most important question. If the operability is high in a given clinic the mortality will be high. The reverse is true of a low operability, for if only the best cases are selected for operation the risk will be less. In order that the student may judge operative results, all statistical reports must include a statement regarding the operability. Harrison Cripps performed radical operations for cancer of the rectum on only 107 of 425 cases—an operability of less than 25 per cent. The five years preceding 1916 our total operability was 53 per cent., but in the last three years it rose to 71.8 per cent., indicating that a chance for cure is now being given to a larger percentage of patients with this otherwise hopeless condition than formerly. That the operation is becoming more extensive is shown by the fact that in 6 cases we have performed, in addition, a total hysterectomy; in 12 cases we removed the posterior wall of the vagina; in 6 cases the posterior wall of the bladder; in 11 cases a part or all of the prostate, with one or both seminal vesicles, and in 6 cases one or more coils of small intestine. All of these procedures were necessitated by contact extension of the disease.

Mortality. Of 753 patients in the Clinic a radical operation was performed on 430, with a general operative mortality of 15.5 per cent. Before 1910 the operative mortality was 17.8 per cent. From 1910 to 1913 it was 17.7 per cent., the operability being 51 per cent. In this earlier period a higher percentage of cases was seen late. Even at the present time 14 per cent. of the patients, with cancer of the rectum observed, have not had a complete

physical examination, although they have been under treatment elsewhere, and some even have been recently operated on for hemorrhoids. In 1913, 1914, and 1915 the mortality was reduced to 12.5 per cent., the operability was raised to 71.8 per cent., and the operative efforts were more radical.

Judging from the character of the colonic contents it would seem that the lymphatic system of the large bowel is very inactive, very much less active than that of the small intestine. For this reason cancer remains a local disease for comparatively long periods of time. That metastasis through the lymphatics is somewhat modified also by age is evident from the fact that in old people cancer remains a local disease longer than in young people. In a considerable number of necropsies performed on persons who have died from cancer of the rectum without operation it is found that there was little or no glandular involvement, death having been caused by perforation, peritonitis, or obstruction. The question as to operability and probable operative risk can often be answered by a general examination. In many cases, however, it is necessary to make an abdominal exploration to determine the advisability of a radical operation.

Prognosis. Of the number of patients operated on, none less than three years ago, one-third lived three years or more and 28.3 lived five years or more. By subtracting the natural death-rate for the age period and the number of years these percentages become respectivly 37.5 and 35.8 per cent. Greater knowledge of the disease by the public will improve the present statistics for both the mortality and the cure.

The question of control of the bowels must be considered from several standpoints. Colostomies and uncontrolled intestinal openings for the escape of feces, whether they are abdominal or perineal, are much alike if the sigmoid

loop is destroyed in making the new opening. As the left side of the colon is largely muscular and there is no impediment to the discharge of bowel contents after they have passed the splenic flexure the patient with no anal control and with the sigmoid loop eliminated is much better off with an abdominal than with a perineal anus. If with loss of the anus the sigmoid loop can be retained the control will be fair, excepting in case of loose bowel movements. Gas, however, is not controlled. If the cancer is low and the patient is obese, or there are other special reasons, a perineal operation may be chosen without abdominal exploration. With modern technic, however, various forms of abdominal colostomy are possible by which a very fair degree of control can be maintained and abdominal exploration permitted. Undoubtedly a considerable percentage of the Kraske operations done without abdominal exploration were on patients who had no possibility of cure because of internal metastases. Also much of the failure as to permanency of cure by the operations of earlier days was due to lack of exploration and to extraordinary efforts to preserve the normal or posterior location of the anus. Before 1900 the mortality was approximately 20 per cent., with over 90 per cent. of recurrence. We believe that much of the progress in the surgery of cancer of the rectum has come from abdominal exploration and the abdominal colostomy, with the sacrifice of a large area *en bloc* of the diseased bowel. The main purpose of the operation being to cure the best results are secured when unhampered by any special effort to reëstablish the normal control of the anal outlet, except when it is indicated by reason of the location of the cancer. While the union of resected intestine within the abdomen is not followed by stricture, that effected outside of the peritoneal-lined abdomen is practically always followed by stricture, and will usually necessitate some form of colostomy after much effort to maintain the lumen.

This is the more true if there is good control of the anal sphincter and the less true if the sphincter is paralyzed. As to the extent of bowel to be removed, Fagg shows that the disease may extend two inches lower than the apparent growth, while according to Handley it can be found microscopically more than double that distance above the manifest disease. Such, however, are advanced cases, and each individual case must be dealt with on its own merits. In the surgical treatment of malignancy, modern progress has been made by earlier diagnosis and increasingly radical operations. Local recurrence calls for exploration.

The term "rectal cancer" is applied to such growths as are found anywhere between the anus and the lower sigmoid. On anatomical grounds the first inch and a quarter is the anal canal that is lined with pavement epithelium. About 6 per cent. of cancers of the rectum are found in this area. Here appear the epitheliomas and extensions of adenocarcinoma from the lower rectum. Very early local epithelioma may be successfully treated by local excision or destruction by cautery. More extensive disease necessitates the Cripps operation of excision of the anus, which should also include the removal of the inguinal glands, this region having a double lymphatic return. From the anal canal to the peritoneal-covered intestine is the lower rectum in which are found 24 per cent. of the malignant growths of the region, usually adenocarcinomas, the common form of rectal cancer. The Harrison-Cripps, Quenu-Tuttle, and Hartmann operations, with or without the removal of the coccyx, have been the common operative procedures, the upper rectum at times being drawn through the mucous-denuded anal canal to be sutured outside for maintenance of the normal position of outlet, or more commonly brought to the surface at the former position of the coccyx. The upper rectum extends to the rectosigmoid juncture opposite the third sacral vertebra. The

Kraske procedure involves more extensive removal of the lower sacrum with the coccyx, a higher placement of the terminal bowel and a more extensive removal of the rectum. Operation for cancer of the rectum and rectosigmoid should be made by the two-stage interval operation. If by abdominal procedure the division of bowel below the growth can be made at a point which will leave at least one-half inch or more of peritoneal-covered rectum within the cul-de-sac, and the area of the disease to be removed is not too great to prevent coaptation of the divided ends of the bowel, a tube resection can be done with preservation of the control of the anal outlet as a one-stage procedure. A large rubber tube with a one-half-inch lumen is inserted into the terminal proximal opening of the intestine and attached to it by a purse-string suture. The tube is now passed into the rectum from above and out of the anus. As the bowel ends approximate they are sutured, and the tube, being further drawn upon, enfolds the suture line into the rectum. A second row of sutures are then applied, and upon further traction a third row of sutures. All intestinal contents are passed through the tube, and in no way come in contact with the suture line. The anal sphincter is temporarily relaxed by dividing it anteriorly with the cautery. The tube is sutured with catgut to the anus and its position maintained for one week. Cancer of the rectum and rectosigmoid which cannot be radically removed with the preservation of the peritoneal-covered distal bowel is best treated by abdominal exploration, permanent abdominal colostomy, and a Kraske removal of all of the rectum at a period one week later—a two-stage operation. Cancer of the lower sigmoid extending nearly to the rectosigmoid is well treated by the Mikulicz method, separation of the mesentery and elevation of the diseased loop through the exploratory incision to a position above the abdomen. The sides of the intestine being first attached to each other

within the abdomen to prevent the engagement of small intestine, the doubled intestine is sutured to the parietal peritoneum at the point of emergence and the tumor packed round about with vaselin gauze. At the end of a few days the diseased area is excised with the cautery, both ends of the bowel being left open, the upper acting as a temporary colostomy. From the second to the fourth day it is sometimes necessary, before amputation of the tumor, to puncture the proximal side of the loop with a cautery to deliver the gases. In some instances the amputation of the growth may be primary, the ends of the bowel being held by crushing clamps for a few days. From eight to ten days following the primary operation, long-bladed crushing forceps are applied by passing one blade into each of the intestinal tubes, the tissues being crushed by tightening the forceps each day. Usually on the fifth day they cut through, making an entero-enterostomy from within the intestine. In from one to several weeks later, according to the case, the external fistula may be closed. This three-stage operation is one of the safest for the amount of diseased tissue removed. It overcomes the dangers of leakage from resection. In selected cases Bloodgood has obtained the same result in a primary operation by resecting the growth, closing both ends and connecting the sides of the sigmoid loop with a lateral suture anastomosis, the closed ends of the bowel being brought into the abdominal incision to be opened if necessary. We have accomplished the same thing by excising the tumor, uniting the proximal end of the bowel to the sigmoid end to side and bringing the distal end of the sigmoid into the abdominal incision, but not through the muscle. The end which is invaginated by a purse string is not opened unless necessary for gas tension. A rectal tube is inserted for additional safety. The combined perineal and abdominal one-stage operation is a very radical procedure and is responsible for a high mor-

tality, 20 to 36 per cent. This has been lowered somewhat by Cripps by making the abdominal pelvic dissection, closing the abdomen, and by posterior operation immediately elevating the rectum and sigmoid, the bowel not being cut off for two or three days. With exceeding safety we have operated by abdominal incision, dividing the sigmoid, making a permanent abdominal anus, and after closing the distal sigmoid of bowel with its invaginated end into the pelvic space, closing the brim of the pelvis with such peritoneal-covered tissues and peritoneal folds as can be obtained, such as the back of the bladder or the uterus. The total removal of the rectum and lower sigmoid is done at the end of one week through a perineal Kraske incision. By this method the general cavity of the abdomen is not opened at the second operation.

FURTHER OBSERVATIONS UPON THE DIAGNOSIS AND TREATMENT OF SARCOMA OF THE LONG BONES

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My reasons for presenting another paper on a subject that many of you, doubtless, regard as trite are:

1. The importance of the subject.

2. The wide difference of opinion that still exists as to the proper treatment of patients suffering from sarcoma of the long bones.

3. The presentation of new data emphasizing the value of conservative treatment.

Among the reasons for this divergence of opinion are (*a*) that no one surgeon, unless exceptionally favored by circumstances, has sufficient individual experience to permit him to formulate correct rules of procedure; (*b*) the cases reported in literature are either single cases or comparatively small groups of cases treated, as a rule, by amputation, with the after-results traced in but few instances. From such cases it is impossible to lay down definite lines of procedure that the surgeon can apply to the individual cases in hand. Amputation of the limb at the proximal joint, the rule made by Gross in his classic paper of 1879, on "Sarcoma of the Long Bones," is the still almost universal practice of the surgeon today.

It is unnecessary to repeat the data contained in my most recent paper on "Some Problems in the Early Diagnosis and Treatment of Sarcoma of the Long Bones"

(*Annals of Surgery*, November, 1914). I shall merely add some new material and record certain changes of opinion that have been brought about by larger experience. (Note history of patients brought up to June 1, 1917.)

Case I.—*Sarcoma of the lower end of the femur with extensive involvement of the knee-joint; curetting followed by toxin treatment for one year; recovery; two years and nine months; limb sound* (*not previously reported*).

L. G., female, aged twenty-one years, was first seen in consultation with Dr. V. P. Gibney at the Hospital for Ruptured and Crippled in October, 1914. Family history negative; Wassermann negative.

Eight months previous the patient first noticed pain in the left knee while walking up and down stairs. This gradually increased in severity, and shortly after was present even while walking on level surfaces. She consulted a physician, who applied Buck's extension to the knee, with slight temporary relief. A little later she entered a hospital where a plaster of Paris splint was applied, which she wore for five weeks. No improvement was noticed; thereupon several teeth were removed, on the belief that she was suffering from osteoarthritis due to pyorrhea. Later on she was placed upon specific treatment. In spite of these widely varied therapeutic measures the swelling and pain increased and the patient was unable to bear the weight of her body upon the limp. She was admitted to the Hospital for Ruptured and Crippled (Dr. Gibney's service) October 24, 1914, at which time physical examination showed general condition good; heart and lungs normal; patient wearing a plaster splint. There was marked swelling and infiltration of the whole lower end of the left thigh and anterior aspect of the left knee. The knee was completely extended, with very greatly increased abnormal lateral motion, showing de-

struction or extreme laxity of the tissues. There was marked infiltration of the popliteal space and moderate atrophy of the limb.

Measurements: Left: 15, 15½, 12 inches. Right: 14¼, 14, 12 inches.

The *x*-ray showed very marked expansion of the lower extremity of the femur; cortical substance thin and apparently on the point of breaking through; structure of bone disappeared.

In view of the extensive involvement of the knee-joint, accompanied by great tenderness and extreme mobility, we were at first inclined to regard the trouble as tubercular rather than sarcoma. However, on more careful examination and study of the *x*-ray plates we concluded that the disease was undoubtedly a central sarcoma which had pierced the cartilage of the joint, causing joint involvement and effusion. This condition is extremely rare, and we had never, up to that time, seen a case similar to it with such extensive joint involvement. Dr. Gibney and Dr. Whitman also believed the condition to be sarcoma, and thinking it was too far advanced to justify conservative treatment, strongly urged immediate amputation. This, however, was refused by the patient and her family. On November 6, 1914, an exploratory operation was done by Dr. Gibney and myself for microscopic examination. On cutting down to the periosteum a mass was found which occupied the entire lower end of the femur, the central portion of which was greatly expanded and occupied by a tumor having the typical clinical appearance of a sarcoma. It was quite vascular and penetrated into the joint; there was considerable effusion in the joint. As much of the tumor as possible was curetted out and the wound packed. Hemorrhage, which was severe, was fairly well controlled with tight packing, and the limb was put up in a plaster of Paris splint.

Microscopic examination reports: November 10, 1914. "Mixed-cell sarcoma."

(Signed) F. M. Jeffries, Pathologist to Hospital for Ruptured and Crippled and Department of Pathology, Cornell University Medical College. Tumor of femur. No. 6231.

The material consists of several broken portions of tumor tissue, each about 1 cm. in diameter.

On section the masses are composed of dense fibrous tissue, in many places hyaline, covered with a fringe of sarcomatous tissue of the type of giant-cell sarcoma. The giant cells are of the epulis type. There are a few trabeculæ of bone, which are separated by spindle tumor cells, and are undergoing absorption. In several places the dense fibrous tissue is infiltrated by strands of tumor tissue in which the cells are spindle in form, with slightly hyperchromatic nuclei, but without admixture of giant cells.

In the absence of full data regarding the anatomy of the tumor and its clinical course it is impossible to give any positive opinion of the clinical malignancy of the case. The giant-cell areas belong in a group which generally pursue a benign course. The spindle-cell areas seem to possess greater growth capacity.

(Signed) J. Ewing.

X-ray examination November 11, 1914, showed "an attempt at formation of a new joint; shaft of femur rests on outer articular surface of tibia. Over the inner articular, to correspond with the inner condyle, is new bone formation making a contour of fairly good joint; no ankylosis between femur and tibia. Lateral view shows new bone formation anterior to the patella; appears to be some ankylosis with the patella; no evidence of metastasis."

Inasmuch as the sinus had failed to heal the patient

was given an anesthetic and through-and-through drainage was established; curettings carefully examined by Dr. Ewing failed to show any evidence of malignancy. Rubber tubes were inserted and kept in for a number of months.

A few days after the exploratory operation the patient was put upon the mixed toxins of erysipelas and Bacillus prodigiosus, the initial dose being 1 minim, which was increased daily by ½ minim until 8½ minims, the highest dose, had been reached on December 27, which produced a temperature of 104°. A short interval of a week's rest was then given, after which the toxins were resumed and kept up for one year, with occasional brief periods of rest. Seventy-three injections in all were given.

December 2, 1915, Dr. Gibney reported there was no deformity; the limb was straight, with little if any motion. Two days later the patient was discharged from the Hospital for Ruptured and Crippled, wearing a brace, with a long spring which protected the joint, on the right leg.

The patient was readmitted to the Hospital for Ruptured and Crippled March 7, 1916, for inspection of the old sinus. Just before admission she developed pain and slight fever. Examination revealed what was apparently inflammatory enlargement of the knee, with a boggy swelling of the popliteal region. These symptoms continued and later fluctuation developed.

In March, 1916, under local anesthesia, an incision was made in the popliteal opening and a small abscess was found which apparently communicated with the old sinuses. One of these was opened and curetted, and both openings were drained. Examination of the curettings again failed to show evidence of malignancy. She was then treated with "Dakin fluid" and rapid healing followed. The toxin treatment was resumed for a brief period, and the patient has remained in good health and

free from recurrence ever since, upward of two years since the beginning of her trouble; she has gained thirty-five pounds in weight.

Since the publication of my previous paper we have learned much more about the value of radium in malignant tumors and still more about the methods of using it.

CASES ILLUSTRATING THE EFFECT OF RADIUM TREATMENT IN CARCINOMA OF THE LONG BONES

Up to the present time the number of cases of sarcoma of the long bones treated by radium in sufficient quantities, and in the hands of men experienced in the therapeutic use of radium, is too small to permit of any broad conclusions. In a few cases, however, very striking results have been obtained with radium, not only in the central or myeloid type of sarcoma, but also in a few cases of periosteal sarcoma.

The objection to the use of radium alone in periosteal sarcoma of the long bones is that the treatment is probably chiefly local and not systemic; that no matter how completely the radium has destroyed the local tumor it certainly has not destroyed it more completely than by amputation of the limb. All our statistics prove that amputation almost never cures the patient, death occurring from metastases after a longer or shorter interval. It is difficult to explain the successes obtained in periosteal sarcoma treated with the toxins alone, without other treatment, except on the theory that the systemic action destroyed the infected cells in other parts of the body before and in some cases after they had given rise to definite metastatic tumors.

If this explanation be true we have the strongest kind of argument in favor of using both radium and toxins in the periosteal group of sarcoma of the long bones. The

cases of periosteal sarcoma of the long bones thus far treated by radium and reported in the literature are too few to permit of any conclusions of value. Hence it might be of interest to give brief histories of 15 cases that have come under our immediate observation at the Memorial Hospital and Hospital for Ruptured and Crippled.

Case II.—*Extensive sarcoma of the upper end of the tibia involving the fibula; conservative treatment; limb sound.*

C. F., female, aged seventeen years, was admitted to the Hospital for Ruptured and Crippled July 22, 1915, with a history of having first noticed trouble in the upper part of the right leg, just below the knee-joint, six months prior to her admission. This consisted of a small swelling on the inner side of the upper portion of the right tibia, slight amount of pain, increasing disability, and moderate loss of weight; no enlargement of glands in the groin. During the four months previous to her admission she had been treated by several physicians, who gave various diagnoses. At our Orthopedic Hospital she was treated for specific disease.

Physical examination at the time of her admission to the Hospital for Ruptured and Crippled showed a symmetrical enlargement of the whole upper portion of the right leg, most marked below the patella. The limb could be flexed to about a right angle; no muscular spasm. Over the inner portion the tumor was extremely soft on palpation, having the "feel" of semifluctuation. Measurements:

Right: 11½, 12, 12¾, 13¼ inches. Left: 11½, 11⅝, 11½, 10¾ inches.

X-ray showed a tumor involving the entire upper extremity of the tibia, the bony structure of which was practically destroyed except on the outer and upper aspect; the other bones were not affected. The disease was so

extensive that amputation was strongly advised, but refused by the patient.

In view of the successful results which were obtained with the toxins in a case of sarcoma of the lower end of the femur, involving the joint (the case just reported), I advised conservative treatment in the present case, *i. e.*, curetting for a microscopic section, to be followed by a course of toxin treatment. In this opinion Dr. Gibney concurred.

August 2, 1915, a four-inch vertical incision was made below the knee. The tumor was curetted and found to involve the whole upper part of the tibia for a distance of four inches and nearly the same length of fibula, with the exception of the outer wall. A thin layer of cartilage, which was perforated in curetting, was all that was left of the upper end of the tibia. The wound was packed with gauze and a roller bandage tightly applied; the limb was put up in plaster of Paris before removing the tourniquet.

Pathological examination made by Dr. F. M. Jeffries (pathologist to the Hospital for Ruptured and Crippled) read as follows:

August 5, 1915: "Giant-cell sarcoma; melanotic."

Dr. Ewing also examined a section microscopically and reported:

August 7, 1915: "Tissue is composed of typical giant-cell sarcoma of epulis type and of very moderate malignancy."

A third examination was made by Dr. George Barrie, of the Post-Graduate Hospital, who pronounced it "fibro-sarcoma with giant cells."

The clinical history of rapid development and extensive involvement furnished sufficient evidence that we were dealing with a malignant tumor. Blood examination, August 10, 1915: Red blood cells, 4,700,000; hemoglobin, 85 per cent.

Four days after curetting the patient was put upon small doses of the mixed toxins of erysipelas and Bacillus prodigiosus (no other treatment). The initial dose, ½ minim, was increased daily by ½ minim until a decided reaction; temperature of 102°, 103°, 104° was obtained, after which four injections a week were given.

The cavity gradually filled up with healthy granulations, and a note by Dr. V. P. Gibney, dated November 15, 1915, states:

"Open sinus over inner head of tibia; no infiltration about knee. Small range of motion allowed; not fully tested. General condition excellent; on high road to recovery."

The leg and thigh were kept in a plaster splint and the sinus treated through a window in the splint. By December 1 the sinus had closed and there was no evidence of any tumor either by physical or *x*-ray examination. *X*-ray pictures were taken regularly every two weeks. Marked new formation of bone could be noticed in the upper end of the tibia, which was completely destroyed at the time of operation. The patient also gained in weight and strength. On December 27, 1915, she was shown before the Alumni Association of the Hospital for Ruptured and Crippled, at which time there was no evidence of any lesion present.

January 9 the patient suffered from an attack of grippe and the toxin treatment was discontinued for two weeks. January 26 the plaster cast was removed and a recurrent tumor, the size of a pullet's egg, was found at the upper and inner end of the right tibia, at the site of the old sinus. An *x*-ray picture taken also showed the growth. The toxin treatment was again administered and given both locally and systemically. The tumor diminished somewhat in size but did not disappear, and March 3, 1916, I again curetted a portion of the growth, about the

size of a hen's egg, and packed the wound. A microscopic examination was made by Dr. Ewing, who pronounced it "giant-cell sarcoma."

Blood examination, March 5, 1916: Red blood cells, 4,856,000; white blood cells, 7800; hemoglobin, 82 per cent.

March 10 I applied 100 mg. of radium over the site of the tumor, allowing same to remain for twenty-three hours. The toxin treatment also was resumed, the doses being increased every other day up to the point of producing a temperature of 102° to 103°. The soft tumor-like area slowly increased in size, and by April 1 it measured 1 x ¾ inches; non-fluctuating. April 8 I again applied 150 mg. of radium emanations over the articular surface of the tibia. July 22 240 mg. of radium were applied over the same site for fourteen hours. Her local condition continued to improve, the sinus gradually healed, and the patient's general condition returned to normal. The toxins were continued during the summer, with occasional intervals of rest. October 4, 1916, when she left the hospital, there was no sign of a tumor, and she was in good physical condition.

At present, June 6, 1917 (nearly two years since the beginning of treatment), there are no signs of local or general recurrence, and she has gained twenty-four pounds in weight.

One of the most remarkable results with radium in periosteal sarcoma that we have observed is the following:

Case IV.—*W. T., male, aged eighteen years, admitted November 23, 1915. It should be emphasized at this time that the good result in this case is entirely due to Dr. Joseph Bissell, who used radium after I had apparently failed to control the disease with toxins and we had advised amputation. Family history good.*

The patient strained the muscles of his left thigh one

and a half years ago. A few months later he noticed a swelling in the anterior and middle portions of the femur, which gradually increased in size, and was associated with moderate pain. He entered Bellevue Hospital in the early part of November, 1915, where an *x*-ray picture and exploratory operation confirmed the clinical diagnosis of sarcoma of the femur. Amputation was advised but refused. He was then admitted to the Memorial Hospital and placed on my service.

Physical examination at this time showed a large fusiform tumor occupying nearly three-quarters of the femur, the largest circumference being about the middle, sloping off at either end and leaving only two or three inches at the upper and lower end not involved. Two recent cicatrices, six inches long, were noted on the anterior and lateral aspects. The toxin treatment was begun November 24 and continued until December 20. He had in all twelve injections, the highest dose being 7 minims, and the highest temperature, 102°.

An *x*-ray taken at the time of his entrance showed: "Slight roughening of the bone with slight indication of periosteal fringing. However this is not at all characteristic and the shaft of the bone is not involved. Tumor is made up of tissue softer than bone."

Examination December 22 revealed some enlarged glands in the groin, not definitely characteristic of metastasis but probably the result of the toxin treatment.

Bellevue Hospital pathological report (Dr. Norris): "Specimen consists of muscle which in places is necrotic, showing areas of inflammatory edema. Lymph vessels show foci of spindle cells; also larger areas which suggest round-cell sarcoma."

Later report of Dr. Norris stated he had no doubt it was a sarcoma.

Clinically, the tumor had the typical appearance of

periosteal sarcoma, and I have no doubt of the correctness of this diagnosis. The slide was later examined by Dr. Ewing, who confirmed the diagnosis of sarcoma.

During the first two weeks of toxin treatment the disease showed practically no increase in size, but later on it began to increase slowly, and Dr. Downes and myself advised amputation, which had originally been urged at Bellevue. The patient refused and left the hospital in January, 1916, and later came under the care of Dr. Joseph Bissell, who applied four radium treatments at intervals of two weeks. A month later he returned to the Memorial Hospital for observation. Careful examination showed scarcely any trace of the original tumor. He was suffering from some superficial radium burns, which, however, were of little moment. These were later treated at Bellevue Hospital, and still later in a convalescent home, the doctor in charge of which wrote me November 25, 1916: "Patient walks about without crutches or cane. The radium burns are getting well very slowly. Other than these burns he has no symptoms at all."

Personal examination, December 18, 1916, nearly one year after radium treatment: Left femur has an hour-glass appearance, with contraction a little below the middle. This contracted area extends around almost the entire circumference of the thigh, except at the posterior aspect; it is most marked on the outer and inner surfaces. The whole area is markedly reddened, apparently caused by radium burns, and can be described as being 3 x 4 inches in width, and extending almost from the posterior and inner aspect of the thigh around to the anterior and middle of the outer surface for a distance of 9½ inches. There are several other deep-seated ulcerated areas on the inner side, one ¾ inch in diameter, one on the anterior surface 2½ inches in diameter, and the largest, on the outer side, 3 x 11.2 inches. The surface is irregular, with

deep pittings in certain areas and covered with sluggish granulations. In addition to these there are similar ulcerations some distance away from the main ones, more superficial in character. No tumor can be definitely made out, although there is apparently some thickening of the femur above the condyle anteriorly. The glands in the groin are enlarged, probably due to ulceration. General condition good; weight considerably below normal, but patient is not emaciated.

Measurements over the contracted area of the thigh are 12½ inches on the left and 16¼ inches on the opposite side.

X-ray examination made December 18, 1916, showed apparent disappearance of most if not all of the tumor of the femur. *X*-ray examination of the chest showed suspicious but not positive signs of metastases in lung.

April 20, 1917, patient reported in good condition by Dr. Bissell.

June 6, patient himself stated he was very well.

Case V.—*Periosteal small round-cell sarcoma of the tibia, disappearance of tumor under combined treatment with the mixed toxins and radium (later recurrence).*

M. H., female, aged eight years, was admitted to the Hospital for Ruptured and Crippled October 16, 1916. A tumor situated in about the middle of the left leg was first noticed in June, 1916. There was no history of previous trauma. Physical examination October 14, 1916, showed a tumor occupying nearly two-thirds of the left leg, extending from the upper end of the tibia to within two inches of the internal malleolus. The tumor apparently originated at about the middle of the tibia, at which point the circumference was greatest. It was fairly firm in consistence and fixed, apparently starting in the periosteum of the bone infiltrating the soft parts and extending completely around the leg, causing a general fusiform enlarge-

ment of nearly the whole leg; superficial veins were dilated. The *x*-ray picture taken showed some irregularity and thickening of the periosteum on the inner and outer aspect of the tibia.

The patient was admitted to Dr. Whitman's service and a clinical diagnosis of sarcoma was confirmed by an exploratory operation and microscopic examination by Dr. Barrie, of the Hospital for Ruptured and Crippled. The latter showed it to be a "small round-cell sarcoma," which diagnosis was later confirmed by Dr. Ewing. The toxins were begun on October 30 and local injections were made directly into the tumor, the initial dose being 1/5 minim, which produced a moderate reaction. The local injections were rapidly increased up to 1½ minims, which produced a temperature of 105°. November 14, 125 mg. of radium emanations, obtained from the Memorial Hospital, were applied for seven hours, the applicator being changed so as to cover the entire tumor area. The tumor had already shown marked decrease in size before the radium was used, and this became more rapid during the next two or three weeks. Most of the tumor disappeared by absorption, but a considerable portion in the neighborhood of the exploratory wound broke down and became necrotic. At the end of one month the circumference of the middle of the calf of the leg had decreased 1¼ inches. In the latter part of December another application of radium emanations, 250 mg., was used for twelve hours. January 15, 1917, very little of the tumor remained, and an *x*-ray picture taken showed no evidence of metastases. The toxins have been continued two or three times a week up to the present time. The patient began to gain weight in January, until now she has regained her normal weight and is also in good general condition. The tumor has apparently entirely disappeared. I propose to keep up the injections of toxins for another six months, with occasional intervals of rest.

May 1, 1917. Slight thickening can be noticed at the lower portion of the tibia a little above the ankle, probably a recrudescence of the tumor.

May 18. Evidence of a recurrence more marked. Patient put upon local toxin injections and radium again applied; 600 mc. for twelve hours.

June 20. Some decrease in the sign of the tumor. Patient gaining weight. *X*-ray shows no metastasis in chest. Prognosis doubtful.

July 24. Tumor has nearly disappeared; patient has gained five pounds in weight.

The following three cases illustrate the extreme malignancy of periosteal sarcoma of the femur in which neither toxins nor radium apparently had any effect in controlling the disease, and in which lung metastasis developed a few weeks later.

Case VI.—*J. B., female, aged fourteen years. Family history negative; no history of antecedent trauma.*

The first symptoms noticed five weeks before admission was slight lameness. Shortly afterward pain occurred in the region of the knee and increased in severity, so that she was unable to sleep nights. No night sweats; no cough; no marked loss of weight. A few days after the lump and pain were noticed there appeared a swelling at the lower end of the right femur a little above the joint. The pain ran from the thigh to the ankle, but never to the hip. The leg increased slowly in size and became markedly flexed at the knee; could not be straightened.

One month before admission she was examined at one of the large surgical clinics of this city and was told that she had osteomyelitis. Operation was advised. She was admitted to the Hospital for Ruptured and Crippled July 11, 1916, on Dr. Whitman's service. Physical examination at this time showed the patient to walk with a limp and evident discomfort; enlargements and infiltrations

about the right knee, confined to the lower extremity of the femur, evidently involving the bone. No synovitis. Enlargement most marked on inner aspect. Sensitive to pressure; no fluctuation; motions of joint slightly restricted on flexion and extension. Measurements showed an increase on the right side of 2¼ inches over the corresponding measurement on the other side, *i. e.*, 13½ on the right and 11¼ on the left side.

The *x*-ray shows an involvement of the lower portion of the femur just above the epiphysis, apparently an infiltrating tumor, which also involves the tissues surrounding the bone. The patient was kindly referred to me by Dr. Whitman, for the toxin treatment, in the hope of preventing an amputation. The toxins were begun July 24, 1916, ⅛ minim of the unfiltered preparation being given directly into the tumor. July 29 the greatest circumference of the tumor was 15⅛ inches; August 10, 15⅝ inches, August 11, 16 inches. A large dose of radium was applied by Dr. Brown, of the Memorial Hospital (650 mc. for twelve hours).

In spite of increasing the toxins to the point of severe reactions, and in spite of large amounts of radium emanations the increasing size of the tumor, with marked exacerbation of pain, *x*-ray plates showed the steady progress of the disease. This was confirmed also by further *x*-ray pictures. Hence, amputation was advised, and on August 26, 1916, I did a hip-joint amputation with Wyeth's pins. The patient made an excellent and uninterrupted recovery. The patient's father declined the toxin treatment after operation as a prophylactic against recurrence. She left the hospital September 29, 1916.

An *x*-ray taken at this time showed marked metastasis in the right lung. Another picture taken two weeks later showed a pronounced extension of the disease in the lungs. Her general condition declined rapidly and the prognosis

was made of death within a few weks. She died December 10, 1916.

Here we have a case of such rapid growth that the entire duration of the disease, from the time of the first symptom until death, was only a little over six months.

Case VII.—*Periosteal fibro-chondro-sarcoma of upper third of femur.*

E. P., female, aged thirteen years, was admitted to the Hospital for Ruptured and Crippled January 4, 1910, for congenital dislocation of the hip. She was treated for several weeks and then discharged.

November 23, 1916, patient was again admitted to the Ruptured and Crippled Hospital, with the following history: Had noticed a hard swelling on the outer part of the thigh for a number of months. Physical examination at the time of second admission showed a tumor occupying the outer and upper portion of the left thigh, extending from the median line to the trochanter. Patient walked with a limp; flexion, 180 degrees.

X-rays showed periosteum blocked and enormous spiculæ of bone, typical of periosteal sarcoma, present. Central portion of bone not involved.

Clinical and *x*-ray diagnosis: periosteal sarcoma.

An exploratory operation was performed by me November 20, at which time a tumor, apparently originating in the periosteum, was found and a portion removed for microscopic examination. The same was examined by Dr. Ewing, who reported: Periosteal osteo-fibro-chondro-sarcoma. The mixed toxins were begun November 24 and continued for a little over two weeks, but *x*-rays and measurements showed the disease to have progressed steadily. December 10, 1916, a large amount of radium, 500 mg. of emanations, was applied by Dr. Brown, of the Memorial Hospital, for twelve hours.

The toxins were continued, locally and systemically, up to the point of producing severe reactions (103° to 105°). However, the tumor steadily increased in size and amputation was considered, but after consultation with Dr. Charles H. Peck, Dr. W. A. Downes and the writer it was decided that the disease was too far advanced to permit amputation without grave risk to his life, and with practically no hope of curing the patient. The toxins were resumed, and January 14, 1917, another dose of radium was applied by Dr. Brown, 630 mg. for twelve hours, filtered through 3 mm. of lead and 1 inch of wood.

Little effect was noted either from the radium or toxins. The tumor grew rapidly and caused death in March, 1917. Total duration of disease being only six months.

Case VIII.—*Inoperable round-cell sarcoma of the humerus. Treated with radium and toxins with little result.*

E. B., male, aged eleven years. First noticed pain in the right shoulder January 1, 1916, followed by slight swelling of arm; tumor mass visible by the middle of February. An exploratory operation was done at the French Hospital March 1. Microscopic examination shows the disease to be round-cell sarcoma. The tumor increased very rapidly in size and the patient entered my service at the General Memorial Hospital on April 13, 1916. Physical examination at this time showed the whole upper half of the right humerus symmetrically enlarged by a globular pear-shaped swelling, apparently originating in the humerus, extending from the shoulder joint to the clavicle and as far down as the middle of the shaft; overlying skin involved; spontaneous fracture, entirely inoperable, and although believed quite hopeless, it was decided to give him a trial with the toxins and radium in as large doses as seemed wise. The toxins were begun April 14 and continued until June 14, in doses ranging from 0.5 to 7.5

mm.; the highest temperature obtained was 103°; the injections were given partly local, partly systemic.

X-ray examination showed a typical, periosteal sarcoma of the humerus, with no apparent lung involvement; evidences of spontaneous fracture. Radium was given in as large doses as Dr. Janeway deemed it safe to apply.

April 15. 1000 mc. filtered through 3 mm. lead and 2 mm. of rubber, applied to arm in three areas for four hours each.

June 3. 900 mc. same filter for six hours over shoulder.

There was slight temporary improvement, but the control of the growth was soon lost and the tumor gradually increased in size again. He left the hospital June 17 and died September 1, 1916.

It is only fair to state that we had little reason to expect anything more than temporary control in a case in which the disease was so very far advanced.

Case IX.—*Osteosarcoma of the lower third of the femur.*

S. H., male, aged twenty-one years. Duration of trouble two weeks before admission to the Memorial Hospital June 27, 1916. Physical and *x*-ray examinations at this time showed a typical periosteal sarcoma of the lower third of the femur, situated chiefly on the anterior aspect. Largest circumference over surface of tumor mass July 14 was 17½ inches; August 8, 18½ inches; October 2, 18 inches.

The *x*-ray at the time of admission showed extensive bone involvement; the tumor, made of non-bony tissue, probably periosteal osteosarcoma; glands in hila markedly enlarged. First application of radium was made by Dr. Janeway July 5, consisting of 780 mc. over tumor twelve hours, in each of three areas; 840 mc., 3 mm. lead, 2 cm. distance from skin, eight hours over each of three areas.

During the month of December he also received six *x*-ray treatments over the chest for metastases.

December 13. The case was shown before the weekly conference, at which time there was no marked increase, possibly a decrease in the local condition of the femur, but an *x*-ray picture of the lung showed extensive metastatic involvement. General condition is gradually getting worse. No other treatment than radium was used in this case.

Case X.—*Periosteal sarcoma of the femur; amputation; toxins; recurrence in stump; radium and toxins, no effect; death.*

I. P., male, aged twenty-one years, was first admitted to the Memorial Hospital January 13, 1916, shortly after which I did an amputation just below the trochanter for a periosteal sarcoma of the femur, and he was discharged March 18. In April there was a local recurrence in the stump, which grew with great rapidity. He was treated with large doses of radium by Dr. Janeway (800 mc. applied to stump for four hours; 3 mm. lead and 2 mm. of rubber for four hours, and changed to cover whole area), and also toxins, without the slightest effect in checking the growth, and the patient died two months later. The pathological report in this case read: "The tumor is composed of large polyhedral or elongated tumor cells, with very hyperchromatic nuclei and very few giant cells."

This was an extremely malignant type of sarcoma, the whole duration of the disease being less than six months.

That sarcoma has a tendency to originate at the site of an old or recent fracture has been recognized for many years. Sir Frederick Eve, in 1888 (*Tr. Path. Soc. of London,* 1888, xxxix, 273), reported a very interesting case of central fibrosarcoma expanding tibia, accompanied by extreme cystic degeneration, in a man, aged twenty-four years. He had had a fracture in the middle of the

tube ten years previously; a small lump had remained in the neighborhood of the fracture ever since the injury. It had been more or less painful, especially at times of change in the weather, but had not shown any enlargement until just previous to the time of admission to the hospital. Mr. Eve stated that it was unusual for a central tumor of the bone to be microscopically so highly organized. Eve cited another case (specimen in the museum of St. Bartholomew's Hospital), also a fibrosarcoma, springing from the inner surface of the tibia. The patient had sustained a fracture in the middle of the leg; a tumor developed shortly afterward. Three years later she again fractured the same bone lower down. The tumor grew slowly. The leg did not come to amputation until eight years afterward. Another specimen, also from the museum of St. Bartholomew's Hospital, represented an osteochondroma of the femur following fracture. With reference to this, Eve states, "The relations of injury and inflammation as exciting causes of tumors of bone are too evident to be doubted."

Our own cases furnish convincing proof that antecedent stroma is a most important causation factor in the development of sarcoma of the long bones (vid. paper "Injury as Causative Factor in Cancer," *Annals of Surgery,* 1911). The following case is interesting as being somewhat similar to Eve's case:

Case XI.—*Periosteal sarcoma (spindle and giant-cell) in an old fracture; toxins and radium before amputation; little effect; amputation followed by toxins.*

I. H. F., male, aged forty-eight years, referred to me by Dr. David Barrows, of Lexington, Ky., and admitted to the General Memorial Hospital October 6, 1916. Family history negative. Personal history: At the age of four years he had a fracture of the right femur, a little above the middle third, from a fall; at the age of eleven years he had a second fracture of the right femur at the same

site. He had good use of the leg until the age of twenty-one years, except that it was more easily tired than the left; at this time, *i. e.*, twenty-seven years ago, a diffuse periostitis set in at the site of the old fracture. No operation was performed. He gradually lost the use of the leg and has been obliged to use crutches for several years. This condition continued until June, 1916, when the patient noticed an enlargement at the site of the fracture, associated with considerable pain, increased disability, and moderate loss of weight. August 1, 1916, he was operated on by Dr. Barrows, the latter believing there might be a sequestrum that caused the trouble. The tissues removed were examined by Dr. A. S. Warthin, of the University of Michigan, and pronounced spindle-cell sarcoma. Eight *x*-ray treatments were given, with little effect, and the tumor gradually increased in size. Physical examination at the time of admission to the General Memorial Hospital, October 6, showed 3½ inches below the trochanter, on the right femur, a tumor covering the anterior and outer aspects of the leg, from Hunter's canal downward, covering three-fourths of the circumference of the thigh; there is an old cicatrix, 8½ inches long, over the central portion, ulcerated over an area of 2½ by 3 inches. The tumor is smooth and fusiform in shape and firmly fixed to the femur itself; it is firm but not hard in consistence. There is slight dermatitis over the tumor, probably the result of the *x*-ray. The right side was markedly atrophied and the knee-joint almost ankylosed. The patient's general condition was poor; he had lost considerable weight and was anemic and weak. *X*-ray examination, October 17, showed "extensive localized destruction of femur, not characteristic of periosteal sarcoma, and fibrosis at hila of lungs. No metastasis in parenchyma; tubercles in left lung."

The toxins were given in small doses from October 16 to 28; the highest temperature obtained was 102°.

October 21. Radium was applied by Dr. H. H. Janeway, 170 mc. through 3 mm. of lead filter and 2 cm. of wood in flat applications and left for four hours over several areas until the entire tumor had been covered.

In view of the fact that the tumor was increasing in size, in spite of toxins, radium, and *x*-rays, it was thought unwise to longer delay amputation, and on October 31, under gas and ether anesthesia, I performed a hip-joint amputation. The patient made a good recovery.

In this case sufficient time did not elapse to determine the full effect of the radium, but as the tumor was increasing at the end of ten days and his general condition was getting worse, it was feared the patient would not be able to stand an amputation if delayed longer. Spontaneous fracture had occurred.

The microscopic examination of the specimen by Dr. Ewing shows: "Large spindle and giant-cell sarcoma. The structure resembles myosarcoma and not the usual bone sarcoma. The spindle cells are very long and their cytoplasm is very acidophile. The giant cells are mononuclear."

The pathology of this tumor is of considerable interest and has been made a special study by Dr. Müller (of Dr. Ewing's laboratory, Cornell University Medical College). The theory advanced by Dr. Müller, and accepted by Dr. Ewing, is that the sarcoma started primarily in the muscles about the thigh, possibly at the site of the old trauma, and secondarily involved the periosteum and marrow of the bone. This theory, Dr. Müller believes, is supported by the fact that the tumor cells bear greater resemblance to myosarcoma than periosteal sarcoma. Without attempting to dispute this view it is only fair to state that certain clinical facts seem against it: (1) At the time of Dr. Barrow's exploratory operation in August, 1916 (three months before amputation), the tumor appeared to be of periosteal

origin, and even then the marrow of the bone was invaded. (2) The strongest objection is that while we have very frequently found the fascia and muscle in periosteal sarcoma to be invaded by the tumor, the converse of the tumor starting in the muscle and invading the periosteum and the bone itself is practically an unknown occurrence, and one which I myself have never seen, unless this case is an exception.

The interval betwen the fracture and development of the tumor in this case was much longer than I have personally observed in any other case or that I have found in the literature. While, with Eve, we must admit that injury in the way of a blow or, in a more limited number of cases, a fracture is an important causative factor in the development of sarcoma of the long bones, the explanation of just how it acts has not, so far, been given. For a fuller discussion of this subject the reader is referred to a paper on "Injury as a Causative Factor in Cancer" (*Annals of Surgery,* May, 1911).

The patient has been taking the toxins in moderate doses since the operation, and is in good health at present, July 24, 1917.

Case XII.—*Periosteal sarcoma of the right femur, radium treatment four months; local condition greatly improved; later amputation; lung metastasis.*

A. A., male, aged ten years, admitted to the General Memorial Hospital May 29, 1915, discharged September 20, 1915. The tumor was situated just below the middle of the femur and had appeared one month after a local injury. Circumference of the limb on the side of the tumor was one inch larger than the other. Clinical and *x*-ray diagnosis: Periosteal sarcoma.

August 17. *X*-ray shows "spontaneous fracture, distinct distortion, associated with a good deal of periosteal repair."

August 25. Radiogram shows "irregular outlines of heart not distinctive of metastases; glands at hila of lungs slightly enlarged and not diagnostic."

May 30. 500 m.c. of radium through 3 m.m. lead filter was applied around the limb at site of tumor by Dr. Janeway.

June 16. "The tumor of the thigh has reduced to one-third its size before treatment."

August 13. A spontaneous fracture has developed.

September 20. Discharged from the General Memorial Hospital and entered the New Haven Hospital, where the leg was amputated.

October 15. The patient was found to be suffering from symptoms which pointed to the presence of lung metastasis.

This case was treated by radium alone at the Memorial Hospital by Dr. Janeway, without any toxins or other treatment.

Case XIII.—*Osteosarcoma of the forearm apparently originating in the ulna.*

B. S., aged thirty-seven years, was admitted to the Memorial Hospital March 24, 1916, with the following history: Four years ago the patient sprained his left wrist, shortly after which there appeared a small lump on the ulnar surface of the arm, which increased in size until it had reached about the size of an orange. In January, 1916, the tumor was partially removed at the Bayonne Hospital and pronounced sarcoma, on microscopic examination; type not stated. A recurrence took place shortly after on the back of the arm over the head of the radius and a second operation was performed February 2, 1916.

The tumor again recurred and grew rapidly until the time of his admission to the Memorial Hospital, March 24, 1916, at which time physical examination showed a hard, markedly protuberant tumor, oval in shape, measuring

10 x 8 cm., extending from the ulnar side of the forearm around posteriorly to just beyond the median line on the radial side; no infiltration or tenderness; skin slightly reddened.

X-ray diagnosis made by Dr. Holding: "Periosteal osteosarcoma of ulna involving radius and wrist bones and causing pathological changes in these bones, whether trophic or neoplastic I am unable to state. Slight increase in the density of the shadows over the hilum of the right lung, probably not metastatic. No metastases in parenchyma."

He received the following radium treatments (administered by Dr. Janeway):

March 31, 3098 m.c.h.
April 12, 7200 m.c.h.
April 29, 3600 m.c.h.
May 2, 1200 m.c.h.
July 3, 3840 m.c.h.

Between May and June the disease was apparently held in check, as shown by the following measurements:

May 14, 10¾ inches over tumor mass.
May 18, 10⅝ inches over tumor mass.
May 25, 10½ inches over tumor mass.
May 30, 10⅜ inches over tumor mass.

After that, however, it again began to increase in size, and measurements July 20 showed the tumor to be 11¼ inches. At a conference of the hospital staff it was decided unwise to continue conservative treatment further, and amputation was advised. The patient at first consented and then refused, leaving the hospital July 21, since which time nothing further has been heard of him.

In this case there was slight improvement at first, but later even large doses of radium failed to check the growth.

Case XIV.—*Periosteal sarcoma of the humerus, "round cell."*

J. K., male, aged fifty-six years, was referred to me by

Dr. Charles W. Stewart, of Newport, R. I., with the history of having been struck, fourteen years ago, with a heavy iron bar over the upper part of the left arm, causing marked ecchymosis. He was laid up for a couple of days, but had no further trouble until April, 1916, when he first noticed enlargement of the outer and middle aspect of the left arm, which gradually increased in size, with little pain or discomfort.

Physical examination October 3, 1916, showed a globular tumor occupying the anterior and upper posterior aspects of the left arm, almost completely surrounding it; skin normal in appearance; superficial veins slightly dilated over the left side. The greatest circumference was seventeen inches; corresponding measurement of other arm, 12¼ inches. The tumor was very soft, almost semi-fluctuating in consistence. *X*-ray showed periosteal involvement, and confirmed the diagnosis of periosteal sarcoma.

The mixed toxins were begun October 4, and continued locally and systemically until October 23, sixteen doses in all being given. The highest local dose was ⅛ m.m., and the highest systemic, 6½ m.m. The highest temperature obtained was 103.5°.

The patient showed little improvement under the toxins, and on October 16, 5000 mc. of radium emanations were given externally filtered through 1 m.m. of platinum and 2 cm. of wood. In a week there was slight decrease in size in the region covered with the radium, but the other portion of the tumor seemed to have increased, and the forearm showed evidence of beginning edema. Under these conditions amputation was advised, which the patient preferred to have carried out at home. In the early part of November Dr. Stewart performed the amputation, from which the patient made an uninterrupted recovery. Microscopic report sent to me by Dr. S. read: "Small round-cell sarcoma."

Case XV.—*Central sarcoma of the lower end of the femur, giant-, spindle- and round-cell, with extensive involvement of the knee-joint and upper end of tibia; amputation advised but refused; treated with toxins and radium; well at present, July 24, 1917; nine months.*

C. S., female, aged twenty-nine years. Family history: no tuberculosis or specific disease. In March, 1916, or six months before she came under my observation, the patient first noticed slight pain just above the knee. Shortly after a swelling developed over the inner condyle, which gradually increased in size, accompanied by increasing difficulty in walking. The patient was admitted to St. Vincent's Hospital in the middle of October, where *x*-ray pictures were taken and a diagnosis of sarcoma was made. Amputation was strongly advised, but the patient would not consent.

November 10, 1916, she was referred to the writer, at which time physical examination showed a tumor occupying the whole lower end of the femur, most prominent over the anterior and inner portion, extending down to and apparently involving the articular surfaces. The tumor was soft and semifluctuating over most of the area, but varied slightly in consistence. On the inner side it extended down to the level of the lower border of the patella and to the upper portion of the tibia. The tumor was smooth and globular in outline, with veins slightly dilated. Its vertical measurements were 6½ inches on the inner side, 7 inches on the anterior side, and 5½ inches on the outer. The popliteal space was partially filled up with osseous bone. The patient had been unable to walk for five months, and had lost twenty-five pounds in weight.

She was admitted to the Memorial Hospital November 10, at which time the *x*-rays showed a tumor occupying almost the entire lower end of the femur, apparently involving the joint as well.

It was decided to perform an operation, and November 15, under ether anesthesia, a tourniquet was applied at the upper and middle third of the right thigh; an incision four inches long was made over the inner condyle, just below the inner border of the patella. A soft, semifluctuating tumor, about the size of an orange, was found underneath the muscular layers; it had broken through the periosteum, and while not actually infiltrating had pushed to one side and outward the muscles and fascia. By means of a curette and gauze sponges a large mass of soft, grumous, typically sarcomatous material was removed. The semilunar cartilage was apparently entirely destroyed. The upper part of the tibia for about two inches was also destroyed and the whole joint disorganized and occupied by a tumor which extended nearly through the outer condyle of the femur; fibula apparently not involved. Only a thin shell of the outer side of the femur prevented spontaneous fracture. The tumor was finally curetted down to hard bone on the outer side and to the muscles and fascia overlying the popliteal vessels below and down to hard bone in the upper end of the tibia. A cavity as large as a medium-sized orange remained, which was packed with gauze and a plaster splint applied to the leg and thigh before the tourniquet was removed.

Pathological examination by Dr. Ewing: "The tumor has the general features of a giant-cell medullary sarcoma. Several areas are unusually cellular, which indicates a guarded prognosis."

After a further examination of the slide of the tumor Dr. Ewing states: "While it shows certain areas of typical giant cells, there are other areas in which the giant cells are comparatively few in number, and bunches of spindle and round cells are present. While certain areas of the tumor suggest a giant-cell tumor of benign type, there are others suggesting considerable malignancy."

At the end of three days the patient was put upon the mixed toxins of erysipelas and Bacillus prodigiosus, and the dose rapidly increased up to the point of producing severe reactions, the highest dose reached being 14 minims. As soon as the gauze was removed the wound was kept clean by the use of Dakin fluid, it gradually filled up with comparatively normal granulation tissue. An *x*-ray picture taken every two or three weeks showed no recurrence of the tumor.

On March 21, 1917, 1104 m.c. of radium was used externally over the lower end of femur for nine hours.

May 2, 1917, 840 m.c. of radium applied for twelve hours.

May 17, 100 m.c. was introduced into center of bone through old sinus for one hour.

June 26, 90 m.c. was introduced into center of bone through sinus by means of a gold needle applied three different places one hour each.

The patient went home, returning for observation. She is now entirely free from pain and able to bear a certain amount of weight upon the leg. Examination June 22, 1917, showed no return of the tumor and a slowly increasing amount of new bone formation in femur. The upper end of the tibia has now an entirely normal appearance.

When I examined this case I strongly advised amputation, and consented to the use of conservative treatment only on her refusal to have the leg amputated. While in this case it is much too early to in any way regard it as a cure, the results thus far obtained would seem to justify the use of conservative treatment even in far-advanced cases of central sarcoma.

Case XVI.—There is still another case of very far advanced periosteal sarcoma of the upper end of the femur, quite inoperable (spontaneous fracture), in which the growth has been controlled for nearly six months by the

combined use of toxin treatment and radium. The toxin injections were made directly into the tumor and a large amount of radium was applied externally at four different periods. The bone has partially reunited, and there is slight diminution in the size of the tumor. In this case the control of the growth will probably prove only temporary.

While our cases are too few in number to generalize upon they furnish sufficient ground, I think, for stating that radium has a powerful destructive effect upon central, giant-cell sarcomas of the long bones, as already emphasized by Dr. Abbe, and should be tried before amputating the limb.* If radium is used in conjunction with the mixed toxins, we believe the chances of saving the limb are much greater and the chances of recurrence or of metastases are also comparatively diminished.

As far as I know from a careful search of the literature there is no case of periosteal sarcoma permanently cured by *x*-ray or radium when used alone. A case of probable periosteal sarcoma of the femur has been reported by Pearce Gould as successfully treated with radium, but in this case the diagnosis was not absolutely established nor was the period of time which had elapsed sufficient to classify it as a cure. The most striking result is the one reported in our own series treated by Dr. Bissell, but sufficient time has not elapsed to consider it a cure. Our own statistics show a number of cases cured by the toxins alone and a number cured by the toxins combined with the *x*-ray or radium. There would, therefore, seem to be every reason for combining the two agents, one of proved local value, the other of local and systemic value. With such a

* It should be clearly stated that this group of cases of sarcoma of the long bones treated by radium represents the results of a preliminary study and by no means indicates the full measure of benefit that may follow improved technic and more extensive knowledge. I desire to express my appreciation of Dr. Janeway's generous coöperation and help in these cases.

combination, we believe, a cure would be more frequently obtained than is possible by the use of either agent alone. I believe radium offers much more hope in these cases than the *x*-ray.

Diagnosis. In regard to the diagnosis of sarcoma of the long bones, and especially with regard to the advantages and disadvantages of exploratory operation as an aid to diagnosis, the reader is referred to two earlier papers, "Some Problems in the Early Diagnosis and Treatment of Sarcoma of the Long Bones" (*Tr. Am. Surg. Assn.*, April, 1914, and *Annals of Surgery*, November, 1914) and "Myositis Ossificans Traumatica" (*Tr. New York Surg. Soc.*, December, 1912, and *Annals of Surgery*, March, 1913).

In former papers, while advocating exploratory operation in general in sarcoma of the long bones, I believed it unwise in certain types of tumors, particularly the central tumors of the humerus and femur, especially when situated in the popliteal region or in the neighborhood of the large vessels. My reason for this exception was that I had seen serious results in two cases of femur sarcomas of this type (delayed healing of sinuses with subsequent infection, ending in amputation in one case and hemorrhage in the other; both patients are still well six years later).

I have since modified my view in this respect, and would now extend exploratory operation to this very type of tumors if carried out in the following way:

If we apply a tourniquet, even a very large and vascular central sarcoma of the humerus or femur can be evacuated with the curette down to hard bone or healthy tissue, and the cavity tightly packed with gauze, before removing the tourniquet. In this way hemorrhage can always be easily controlled. This is a great advantage over the older way of simply curetting into such a tumor to remove a small

piece for microscopic examination, which often caused severe hemorrhage or persistent sinus, or a fungating growth to develop.

A further advantage is that this method affords a far greater chance of controlling the growth or causing its complete disappearance by making use of the conservative methods of treatment, which have already been mentioned. The toxins can be begun immediately after such an exploration and, within a few days, radium can be placed in the cavity left by the exploration with far better hope of success than if it were used externally through the skin. Finally, the danger of serious infection of the cavity or of persistent sinus can be avoided by the use of Dakin fluid.

The cases that we have observed within the last two years have convinced us that this method of exploration, followed by toxins alone or combined with radium, represents a great advance in the treatment of central sarcomas of the long bones, and makes resection operations rarely necessary.

Periosteal Sarcoma. In regard to periosteal sarcoma we agree with Sir George Makins in his statement made during the discussion of the Royal Society in 1912 regarding the prognosis in periosteal sarcoma. He states: "The removal of the entire bone in periosteal sarcoma was one of the earliest instances of an attempt to do a radical operation for malignant disease. It has been an absolute failure, and whatever opinion might be entertained as to the proper course to follow it is impossible not to sympathize with the proposition that it is not always advisable to be thoroughly radical in these cases. It is a painful task to the surgeon to undertake high amputation for this disease, the only object of which is to prevent unnecessary suffering from spontaneous fracture or some other complication. If cases could be treated in a less drastic manner, with an equal degree of success, poor as the result might be, it would

prove of some satisfaction both to the surgeon and the patient."

If one agrees with this opinion of Makins and Butlin as to the practically hopeless prognosis of periosteal sarcoma of the long bones from surgery alone, one is certainly justified in making an exploratory incision and in trying, for a period at least, any conservative measure that offers the slightest hope of relief or cure. Our own experience has shown the exploratory operation in these cases to be attended with little risk from generalization of the disease and a sinus rarely persists.

Influenced by successes in certain cases in which patients refused amputation, we were led to try toxins more extensively in cases of periosteal sarcoma of the long bones before resorting to amputation. These successful cases are now sufficiently numerous, and have been duplicated in the experience of other surgeons to such an extent that we believe we are justified in advocating, as a routine measure, a course of toxin treatment alone or with radium in most cases of periosteal sarcoma before resorting to amputation. The cases in which radium alone was used are still too few to make it possible to formulate any definite rule of procedure, yet the results obtained in a certain limited number of cases have been so striking as to justify its wider application in this group of cases, and this we are attempting to do at the Memorial Hospital. It seems then, at present, the best method of treatment to combine the toxins, which are systemic in their action with radium, which is largely local; and if no marked improvement is noted at the end of three or four weeks, then amputation can be performed. In all cases of amputation the toxins should be used as a routine treatment for a considerable period after operation, at least six to twelve months, as a prophylactic measure against recurrence.

Results. The following is a very brief summary of the end results in 203 cases personally observed from 1890 to 1917:

97	occurred	in	the	femur	(75	periosteal—22	central)
42	"	"		humerus	(34	" 8	")
32	"	"		tibia	(17	" 15	")
6	"	"		fibula	(6	" 0	")
7	"	"		ulna	(4	" 3	")
8	"	"		radius	(4	" 4	")
2	"	"		metacarpal	(2	" 0	")
1	"	"		metatarsal	(1	" 0	")
8	"	"		clavicle	(8	" 0	")
203					151	52	

METHOD OF TREATMENT

Sarcoma of the Femur. Ninety-seven cases. Amputation was performed in 57 cases, 39 below the trochanter and 18 at the hip-joint; of the latter only 15 were done by me personally, with no mortality. In 30 cases the disease was too far advanced for hip-joint amputation when first observed by the writer. The toxins were used in 66 cases, 22 before and 31 after amputation; 29 were inoperable and hopeless from surgery when first observed.

Sarcoma of the Tibia. Thirty-two cases. Amputation was done in 17 cases; conservative treatment, curetting, followed by the toxins in 2; 3 cases were beyond operation at the time of my first observation. The toxins were used before amputation in 4 cases, after amputation as a prophylactic in 4 cases, and after exploratory operation in 7.

Sarcoma of the Humerus. Forty cases. Amputation was done in 20 cases, incomplete operation in 5, conservative operation followed by the toxins in 3 cases, and in 14 cases the disease was too far advanced for further operation at the time of observation. The total number of these

cases treated with the toxins was 21, of which 7 were too far advanced for amputation.

Sarcoma of the Radius. Eight cases. Amputation was done in 2, radium was used in 1, and the toxins in 5 cases.

Sarcoma of the Ulna. Seven cases. Amputation was done in 2 cases, other operations in 3. The toxins were used in 4 cases, 1 of which had been operated upon.

Sarcoma of the Clavicle. Eight cases. Total excision, 3 cases; 5 cases inoperable at the time of observation.

RESULTS IN SARCOMA OF DIFFERENT LONG BONES—FEMUR

Of the femur cases, 97 in number, 29 were inoperable and hopeless from a surgical stand-point at the time of first observation, and hence should be excluded from the total in making any comparison with other statistics, in which operable cases alone are reported.

Amputation was performed in 57 cases: In 37 just below the trochanter; in 28 at the hip-joint; in 4 cases the patients refused amputation.

The toxins were used in 28 cases before amputation: In 21 after amputation as a prophylactic against recurrence. Of the latter 14 are known to be dead. Of the remaining 7, one, a very extensive periosteal sarcoma which was nearly inoperable, the toxins were given for four months after amputation at the hip-joint. The patient was well three years when last traced. Another, a periosteal round-cell sarcoma in which the toxins were used for nearly a year afterward, is well now eleven years later. A third case, a mixed round- and spindle-cell periosteal sarcoma, treated with the toxins for four months, well eight years.

Two other cases of myeloid and giant-cell sarcoma of the lower end of the femur are well five years after amputation. The toxins were used for nearly a year before amputation; the tumors were practically held under control by

the treatment during this entire time. Amputation was done in one for spontaneous fracture with hemorrhage, in the other case for an old sinus followins exploratory operation this had become impossible.

One case, central sarcoma of the femur, was well five years after hip-joint amputation; no toxins were used.

In addition to the above the toxins were used in the following cases, which were either beyond operation or the patients had refused operation, with the result of saving both the life and limb of the patient:

A periosteal round-cell sarcoma of the lower end of the femur; improvement under *x*-rays, but extensive metastases in the pectoral region and ilium developed while under *x*-ray treatment. Recovery under toxin treatment; well ten years.

A central giant-cell sarcoma of the upper third of the femur, inoperable, disappeared under the toxins and curetting; well eight years.

An extensive periosteal sarcoma of the femur, middle portion; clinical diagnosis confirmed by *x*-ray picture; complete recovery; well five years.

Furthermore, a case of inoperable periosteal sarcoma of the femur, of Dr. Williamson's, of North Dakota, is worthy of note. Diagnosis confirmed by microscopic examination; toxins administered under my direction; no other treatment; well at present, nine years.

NOTE. This case was believed inoperable by the Mayos and toxin treatment advised.

An extensive mixed-cell sarcoma of the lower end of the femur, in which amputation was advised but refused; treated by curetting followed by a course of toxin treatment for a year; complete recovery; well at present, nearly three years.

A central sarcoma of the lower end of the femur, giant-, spindle-, and round-cell, with extensive involvement of the

knee-joint and upper end of the tibia; amputation advised but refused; treated with toxins and radium; well at present, nearly nine months.

RESULTS

Tibia. Four cases treated by amputation alone remained well over three years, one ten years; one remained well seven years and died of metastases in the lung, the third, in which toxins were used after amputation, remained well over three years; and the fourth case (case of Dr. Downes), a periosteal round-cell sarcoma was well nearly five years and then developed metastases in the skull, which recently disappeared under radium and toxins.

July 25, 1917. Evidence of recurrence of the periosteal lesion has appeared and condition is growing worse. One case, a central sarcoma, in which curetting was done, followed by the toxins, remained well seven years. Another, in which curetting was done, developed a recurrence which disappeared under the toxins combined with *x*-rays, and the patient is now well over thirteen years. One, periosteal sarcoma of the spindle-cell type, disappeared under the toxins; the leg was saved and the patient has remained well for seventeen years.

Radius. One periosteal remained well ten years after operation followed by toxin treatment four months.

One giant-cell remained well six years after operation, followed by toxin treatment.

One giant-cell remained well three years, in which toxins alone were used (limb saved).

One giant-cell remained well eight years; curetting only (limb saved).

One giant-cell, in which resection was done, later developed a recurrence in ulna, and amputation was performed by Dr. Lilienthal. Died one year later, lung metastases.

One in which the toxins were used for two years, with little apparent effect, and amputation was done.

One in which radium was used, with slight temporary improvement; amputation was advised but refused.

Ulna. One died of metastases in the abdomen seven years later.

One was treated by resection by another surgeon and result not traced.

One case in which amputation was done, followed by the toxins, remained well over three years.

Two other cases in which amputation was done (1 not traced; 1 died of metastases shortly after).

Results in the Humerus Cases. In 40 cases of sarcoma of the humerus 19 were inoperable at the time of first observation and only 3 are known to be well at the present time. Of the latter 1 was a round- and giant-cell sarcoma (central) of the upper end of the humerus, involving the glenoid cavity, considered inoperable. Curetting was done, followed by the toxins, given for four months by Dr. J. Bapst Blake, of Boston. Patient is now well ten years. The second, a round- and spindle-cell periosteal sarcoma of the middle of the humerus, in which spontaneous fracture took place. The patient recovered under the mixed toxins and remained well for six months, after which an amputation was performed. Shortly after a recurrence took place in the pectoral region, for which an incomplete operation was done, followed by another course of toxin treatment. Patient is now well six years later. The third case, a periosteal sarcoma of the humerus of rapid growth, in which an interscapular thoracic amputation was performed in March, 1917, followed by a course of toxin treatment, is well at the present time. This has recently shown extensive recurrence with metastases in lungs.

Results in the Radius and Ulna Cases. Of the 6 cases in which a permanent cure was apparently obtained in 2

amputations was performed, followed by a course of toxin treatment. In 4 cases the limb was saved; 1 by curetting alone, 1 by curetting, followed by the toxins; 1 by exploratory operation, followed by the toxins; 1 by resection.

Sarcoma of the Fibula. Six cases; 5 female, 1 male. The upper half of the bone was affected in all 6 cases. Primary amputation was done in 4 cases, conservative treatment, followed by amputation, in 2.

The toxins were used before amputation in 4 cases, after amputation in 2.

One case of the spindle-cell type died two years after amputation of metastases; the remaining 5 cases were not traced. No case known to be alive more than three years after treatment.

HISTOLOGICAL STUDY

The histological type of the tumor is given in 146 cases. Of these there were:

62 round-cell.
19 spindle-cell.
15 mixed-cell.
15 chondrosarcoma.
33 giant-cell.
2 myosarcoma.

A study of the different bones show that in 79 cases of sarcoma of the femur in which the histological structure is definitely stated there were:

35 round-cell.
6 spindle-cell.
3 fibrosarcoma.
7 mixed-cell.
4 chondrosarcoma.
2 myxochondrosarcoma.
1 myxosarcoma.
19 giant-cell.

In 9 of these cases no microscopic examination was made, but the patient died of the disease, proving the tumor to have been of malignant origin.

Of 26 cases of sarcoma of the tibia the histological structure is stated as follows:

12 round cell.
5 spindle cell.
4 giant cell.
2 mixed cell.
2 chondrosarcoma.
1 not stated.

Of the 84 cases of sarcoma of the humerus there were:

12 round-cell.
5 spindle-cell.
4 round and spindle cell.
6 giant-cell.
5 chondrosarcoma.
1 osteosarcoma.
1 mixed sarcoma.
1 type not stated.

No microscopic examination was made in 5 of the above cases, but the patients later died of the disease, proving the tumor to have been of malignant nature.

Of the radius cases there were:

2 round cell.
2 spindle cell.
5 giant cell.
3 type not stated.

Of the fibula cases there were:

1 round-cell.
1 mixed cell.
1 spindle cell.
2 type not stated.

Of the radius and ulna cases there were:

2 round cell.

2 spindle cell.

5 giant cell.

3 type not stated.

Bone involved in cases well over three years.

Femur: 12 cases (6 periosteal and 6 central) (limb saved in 4 cases).

Tibia: 6 cases well from three to ten years (limb saved in 3 cases).

Humerus: 2 cases well from six to twelve years (limb saved in 1 case).

Radius: 4 cases well from three to ten years (in 3 cases the limb was saved).

Ulna: 2 cases, 1 died seven years later of abdominal recurrence, no toxins; the other is still well four years later; toxins used after amputation.

Clavicle: 2 cases well from three to eight years (both treated by total excision of the clavicle followed by toxins).

Metatarsal bone: 1 case well ten years, amputation followed by toxins. Toxins used six months after amputation of leg, lower third.

Total: 29 cases well over three years.

In these cases amputation alone was employed in 4 cases, yet in 2 of these metastases developed later; 1 in the skull seven years after amputation of the thigh for sarcoma of the tibia (giant cell) and 1 in the lung five years after amputation of the thigh for sarcoma of the tibia. The limb was saved by a preliminary use of the toxins in 11 cases. In 1 case of giant cell sarcoma of the radius recovery followed simple curetting without toxins, and the patient was well eight years afterward.

In 3 other cases the limb has apparently been saved by the combined use of toxins and *x*-ray or toxins and radium. Two of these are recent cases, and the final result is uncertain.

In comparing this series of cases with other statistics it

is important to note the fact that in a very large proportion of cases the condition was inoperable and hopeless from a surgical standpoint at the time of first observation. In the femur cases, the condition was inoperable at the time of first observation in no less than 30 cases, in the humerus, in 19 cases, and in the others, in 15 cases, or about one-third of the entire number. In spite of this fact, in 29 cases the patients were alive and well more than three years after observation.

Summary of Final Results (Histological Type). Of the entire series, 33 cases are found to have remained well from two to seventeen years and 29 cases from three to seventeen years. Of these 19 were of central origin and 14 of periosteal; 19 cases were treated by amputation, 2 by curetting alone, 3 by curetting combined with the toxins, and 1 by resection.

The histological type of the 19 cases treated by amputation is as follows:

Round cell, 8.
Giant cell, 5.
Mixed cell, 4.
Myxochondrosarcoma, 1.
Chondrosarcoma, 1.

In 15 of the cases in which the limb was saved by the use of the toxins either alone or in combination with curetting, the type of cell was as follows:

Giant cell, 6.
Round cell, 1.
Mixed cell, 4.
Chondrosarcoma, 1.
Spindle cell, 1.
Cases in which only *x*-ray and clinical diagnosis was made, 2.

Among these cases 2 pure giant-cell sarcomas were treated by curetting alone. In 1 case the *x*-ray was used

in addition to the toxins, and in another case radium was applied in addition to the toxins.

Chondrosarcoma. Much difference of opinion exists as to whether the presence or absence of cartilage cells in chondrosarcoma has any influence upon the prognosis. A study of the present series may throw some light upon this question. In 15 cases the type of tumor was designated as "chondrosarcoma," or chondrosarcoma with spindle, round, and giant cells. Of these 10 died, 2 were not traced, and 3 lived beyond the period of three years. This shows that the presence of cartilage cells rather justifies a bad prognosis.

Giant-cell Sarcoma. Space will not permit a full discussion of the very complicated question of the malignancy or lack of malignancy of giant-cell sarcomas of the long bones. I have already discussed it rather fully in a previous paper, "A Plea for More Conservative Treatment of Sarcoma of the Long Bones" (*Jour. Am. Med. Assn.*, January 29, 1910), in which I attempted to show that the extensive statistics of the Bruns Clinic confirmed the opinion already advanced by Gross in 1879, that central giant-cell sarcoma of the long bones, while relatively less malignant than the periosteal sarcomas, can by no means be classed as benign. Gross, referring to Nélaton, Gray and other writers who were disposed to regard these tumors as being habitually of benign character, states, "I shall offer no apology for giving abstracts of the recorded cases of generalization, from which it will be observed that no doubt can be entertained of their not very infrequent malignant nature." He then proceeds to give 5 cases of myeloid sarcoma in which metastases followed amputation.

Butlin's statistic shows no less than 8 out of 33 cases of myeloid or central sarcomas that died of metastases.

There are no statistics on record which so completely prove the malignity of myelogenous sarcoma as those of

the Bruns Clinic, reported by Kocher in the *Beitr. f. klin. Chir.,* 1906, Bd. 1, Heft 1, p. 118. These statistics I have referred to at length in the paper just mentioned. Yet it may be worth repeating that of 65 cases in which the origin of the tumor was definitely stated 33 were of myeloid and 32 of periosteal origin.

Of the 33 myelogenous cases of sarcoma, Kocher excludes 4 cases which were either too far advanced for operation, or the patients refused it. It is fair to assume that these cases ended fatally. Of the remaining 29 cases 17 were treated by amputation, the final results of which are known in only 11 cases. Of these 1 died of the operation. Of the remaining 10 cases, 8 *died of metastases* and 2 remained well from fifteen to twenty years after amputation. Of 7 cases treated by exarticulation, 3 died of the operation; of the other 4, 2 died of a recurrence and 2 of metastases. In other words, only 2 of the 17 cases of myeloid sarcoma treated by amputation were known to have been alive and well beyond the three-year period, and 10 died of metastases.

Of the 32 cases of periosteal sarcoma, 2 refused operation and 1 could not be traced, leaving 29 cases for consideration; 25 were treated by amputation, 2 by exarticulation, 1 by resection, 1 by excochleation.

Of these 29 cases of periosteal sarcoma 4 remained cured (well from three and three-quarters to eight years). All of these had been treated by amputation. In other words, the central or myelogenous group showed almost exactly the same degree of malignity as the periosteal.

Sir Frederick Eve, in his remarks made during the discussion on "Sarcomata and Myelomata of the Long Bones" (*Royal Society of Medicine,* November 12, 1912), stated:

"The broad, general statement made in most text-books that the myelomata are only locally malignant requires considerable modification. The myelomata of the femur,

and especialy those of the upper end of the humerus, are sometimes followed by metastases. According to Butlin's statistics the tumors were giant-cell sarcomas in 3 out of 5 patients who died with metastases after amputation of the femur for central sarcoma. And in 2 out of 3 unsuccessful cases of sarcoma of the upper end of the humerus 2 were described as myeloid sarcoma. Both died from metastases after the performance of Berger's operation. Kausch describes a case of myeloid sarcoma of the upper end of the humerus, treated in 1902 by resection and implantation of two sterilized portions of humerus. Recurrence necessitated amputation at the shoulder-joint. Death occurred from metastases eleven months after the first operation."

Jeanbrau and Riche (*Rev. de Chir.,* 1905, xxxii, p. 160), in reporting the results of collected cases treated by interscapular thoracic amputation for malignant tumors of the shoulder and arm, in which a histological examination had been made, stated, as regards the myeloid sarcomas:

One remained well for seven years (a slow-growing tumor which had existed for three years before operation).

One remained well for seven years and then died of "pulmonary tuberculosis" (in such a case we believe there is always a possibility of death being caused by metastases rather than by tuberculosis).

One remained well for two years and then died of generalization of the disease.

One remained well for fifteen months after operation and then died of metastases.

One remained well for six months after the operation and then died of metastases.

Two remained well for three years (three, or possibly 4, died of metastases).

Wagner (*Inaugural Dissertation,* Würzburg, 1891)

states that the view that all myeloid giant-cell sarcomas are benign is certainly not correct. The cases in which recurrence and metastases followed radical operation are constantly increasing.

As to whether it is possible to tell by the microscopic examination which cases are likely to recur and form metastases he states: "If there is a great preponderance of round cells in the tumor tissue of a myeloid sarcoma and little intercellular substance the prognosis as regards metastases is generally bad." Furthermore, as pointed out by Billroth, the degree of malignancy depends upon the number of vessels entering the tumor, the danger of spreading the disease through the circulation increasing with the number of vessels.

Wagner, himself, in conclusion states that it must be remembered that myelogenous sarcomas that show extensive ossification of the tumor tissue are exceedingly prone to form metastases.

These three characteristics, taken together, he believes, furnish an important guide for the therapy of these tumors. In the presence of any one, or all three, of these conditions mere curetting will not be sufficient to effect a cure. Radical operation is, in his opinion, indicated in such cases.

Our own experience inclines us to the opinion of Billroth and Wagner; however, we would lay less stress upon the presence of the accompanying cell, round or spindle cells, in myeloid tumors, than upon the particular bone in which the tumor originated, agreeing rather with Butlin that sarcomas of the femur and humerus, no matter what the type of cell, are almost universally malignant.

Prognosis. Does a careful histological study of the structure of the tumors of the long bones enable one to make a definite prognosis in cases of sarcoma of the long bones?

If the study is independent of the clinical history and of

the particular bone involved, especially of the part of the bone involved, periosteal or central, then the answer must be a guarded one.

If the tumor has originated in the periosteum of the long bones, regardless of what bone it may be, it makes little difference what the type of cell is, the disease is almost certain to end fatally within a few months to two years, and this in spite of amputation. If the tumor be of central origin, and especially if it originates in the upper part of the tibia or in the lower end of the radius or ulna, and histologically belongs to the giant-cell or epulis type, then the prognosis is comparatively good. A considerable number of these cases can be cured by conservative operation, and a larger number if to conservative operation there be added a course of toxin treatment or radium treatment.

On the other hand, in central tumors originating in the humerus or femur, no matter what the type of cell may be, the prognosis following operation indicating the radical operation of amputation is bad, almost as bad as in the periosteal cases. This opinion is in harmony with Butlin's. In a very few instances the limb as well as the life of the patient has been saved by conservative operations and also by radical operations (amputation at or below the proximal joint), but in the vast majority of the cases the disease has recurred locally or by metastases and finally caused the death of the patient.

The *giant-cell sarcomas* are at present grouped in a separate class and regarded as benign by many pathologists. This does not hold true as regards sarcoma of the long bones. The present series shows 35 cases in which the diagnosis of "giant-cell sarcoma" was made by competent pathologists, that is "giant-cell sarcoma of the epulis type," or "giant- and spindle-cell sarcoma." In several cases a slide was submitted to different pathologists; one called it a "giant-cell sarcoma" and another a "mixed-cell sarcoma."

This difference in interpretation is so great that it is extremely difficult in discussing the problem to be sure that one is talking about the same thing.

In the present series the cases have been divided into the following groups:

1. Pure giant cell, of the epulis type, 18 cases (9 of these patients died at varying intervals after treatment and 9 recovered). In 5 cases death occurred from metastases. In one of these cases the diagnosis was later revised and the tumor was not considered a pure giant-cell sarcoma.

2. Giant- and round-cell sarcoma, 4 cases (3 died and 1 was not traced).

3. Giant- and spindle-cell, 11 cases (7 died, 2 recovered, and 2 were not traced).

4. Giant cell, with presence of cartilage cells, 2 cases (1 died and 1 not traced).

In other words, in 35 cases of giant-cell sarcoma and giant- and round- or spindle-cell tumors no less than 20 died and only 11 are known to have recovered.

Confining ourselves entirely to the pure giant-cell sarcomas we have 9 deaths in a total of 18 cases, which certainly proves beyond question the dictum laid down by Gross that "certain cases of giant-cell sarcoma are really malignant."

Conclusions. A study of the results obtained in this series of cases we believe justifies the abandonment of the traditional method of treatment of all sarcomas of the long bones by immediate amputation and the employment of the conservative methods already described, as a routine measure, before sacrificing the limb. While in each case the decision should be based on the individual merits, we believe that in most cases, irrespective of the origin of the tumor (periosteal or central), or of its histological structure, it is safe to wait for a period of three to six weeks, a sufficient time in which to determine the effect of the toxins

or radium, used singly or combined. If at the end of this period no improvement is noticed, amputation can then be performed without having jeopardized the life of the patient or materially lessened the chance of ultimate recovery. In a small but by no means insignificant number of cases the limb will probably be saved by a preliminary use of these conservative methods.

In cases of central sarcoma of the upper end of the tibia and lower end of the radius and ulna (myeloid type), in place of amputation, which is still advocated by the great majority of surgeons, we can safely substitute curetting, followed by a thorough course of toxin treatment, preferably combined with a local application of radium. In a very large proportion of such cases we believe that the limb can be saved by this procedure. In proof of this we would cite the 4 cases of osteosarcoma treated by Barss by curetting, followed by toxins, at the Surgical Clinic of the University of Michigan, and published in *Jour. Michigan State Med. Soc.*, October, 1916.*

In those cases in which it is found necessary to amputate we believe that the toxins should be administered for a considerable period of time after amputation (six to eight months), in the hope of destroying the cells which have been left behind and which are the cause of local and metastatic recurrences. Our own statistics would appear to establish the value of the toxins as a prophylactic measure after amputation, especially in the periosteal group.

* In two cases the limb was saved and the third eventually came to amputation; the fourth case of inoperable sarcoma of the superior maxilla disappeared under the toxins alone without operation. All the patients were in good health without recurrence April, 1917, nearly two years after treatment.

ULTIMATE RESULTS FOLLOWING NEPHROPEXY IN CASES OF SYMPTOMATIC NEPHROPTOSIS

By John G. Clark, M.D.
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Knowledge concerning the anatomy of organs obtained at autopsy and in the dissecting room has within recent years led to serious errors in symptomatic deductions made in office or bedside studies. Before Schultze began his investigation of the anatomy of the pelvic organs in living women, the view generally held by anatomists was that the uterus normally occupied a retroposed position. This belief was due to the fact that after death the general relaxation of the supporting ligamentary structures permits the uterus to fall backward. Schultze, through the bimanual method of pelvic examination in a series of normal women, was able to prove the contrary position *in vitro.*

Before Glénard published his epoch-making paper in 1885, autopsy protocols seldom recorded the kidney in any other than a fixed lumbar position. Even with a wide range of mobility the kidney after death settles back into its lumbar fossa, and with the congealing of the suprarenal fat the organ is left more or less fixed in *articulo-mortis,* and what was an abnormal position in life becomes a normal one in death. In both instances adherence to classic anatomical standards led to a confusion of theories

as to the symptomatic manifestations from these organs, and, as a consequence, both organs have been subjected to gross therapeutic insults. In every instance in which some form of fixation operation has been devised to fit a certain anatomical pattern these errors have been vividly demonstrated.

From 1890 to 1900, when, through eager but ill-tempered enthusiasm, many surgeons began a most energetic operative propaganda in cases of nephroptosis, too often the chief indication for surgical intervention was the mere presence of a movable kidney in a neurotic woman. Since the majority of women who have movable or floating kidneys are thin-chested, the subjects of enteroptosis, and are poorly developed in many other directions—in other words, are physical defectives from birth—they furnish the worst possible operative risks so far as a restoration to a normal standard of health is concerned. Because of this very injudicious selection of cases, in the earlier phases of this work the greatest opprobrium was cast upon all operations for nephroptosis. So long as the anatomical rule was followed and was sustained by a blanket symptomatology covering all possible phases of gastro-intestinal and neurotic disorders, the beneficial result attained was indeed slender, as the final surgical inventory proved. Like the old-fashioned shotgun prescription it was potentially harmful oftener than it did good execution.

It is not surprising, therefore, that many surgeons who from the first had been conservatively skeptical, became radically antagonistic to any further surgical activity in this field. The effects of such antipodal positions in medicine are usually salutary, for time tends to dampen the ardor of the enthusiast, and holds in leash the pseudo-surgeon while the judicious practitioner who occupies a position midway between an irrational optimism and a stubborn pessimism may take stock, as it were, and from

a careful balancing of equations usually gathers valuable practical conclusions that are applicable to an occasional case.

In the study of our series of 50 cases of nephroptosis, the evolutionary limitation of operative indications, as our own experience has grown, has come from the recognition of our own failures in the neurotic type of women. That vast and prolific domain of neuroses and of gastro-intestinal functional deviations that previously furnished so large a number of cases has of recent years been excluded by all discerning surgeons, for the final demand is that the kidney itself must, through manifest symptoms directly referable to the organ, furnish the indication for an operation. In our series of cases we find that during the earlier years covering a much smaller clinical service in the University Hospital the proportionate number of nephrorrhaphies was much larger than with the present greatly increased departmental census. This numeric shrinkage during the last twelve years is indicated by the following figures: During the years 1900 to 1905 there were 1385 ward admissions; among this number 18 nephropexies occurred. Between 1905 and 1910 there were 1765 admissions, with 15 operations; from 1910 to 1915 there were 2422 admissions, with only 17 operations; in other words, these figures show a steady dimunition in the percentage of elective cases.

If one adheres to the rule that surgical intervention is indicated only when the kidney or the bladder gives expression to symptoms the ratio of cures will compare satisfactorily with that following other approved operative procedures. To define our attitude, I may say that we have settled upon three cardinal indications for possible surgical intervention in movable or floating kidneys; these are, *fixed pain in the renal area, Dietl's crisis, and marked vesical distress referred from the renal area.* Even

these symptoms, however clear, must be supplemented and confirmed by a rigid clinical investigation, which should include a cystoscopic examination, catheterization of the kidney on the affected side, and, in the majority of cases, an injection of thorium and an *x*-ray examination to ascertain the degree of dilatation of the renal pelvis. Any apparent surgical indication not confirmed by these latter diagnostic measures is, in our opinion, open to criticism.

Every possible source of obstruction from lesions of the pelvic organs and from ureteral stricture must be excluded, and when these conditions have been fully complied with and an accurately defined bill of clinical particulars has been established, one is warranted in anticipating, with considerable optimism, a favorable outcome from a properly executed nephrorrhaphy.

In no case is the diagnosis of symptomatic nephroptosis permissible unless a thorough cystoscopic and skiagraphic study of the case has been made. Such procedures are necessary not only because it affords additional evidence on which to base the diagnosis, but also because it eliminates the possibility of a renal lesion, such as calculus or tuberculosis, or of a ureteral stricture being present, which conditions may produce symptoms closely simulating those of movable kidney.

As a means of corroborating the diagnosis, pyelography has proved a valuable aid. In the more advanced cases of pelvic dilatation retention can be demonstrated by the ureteral catheter, but dependence should not be placed upon this alone, or erroneous conclusions may be the result. The picture of the renal pelvis and ureter shown in the pyelogram affords indisputable evidence, and often furnishes information concerning other lesions that would escape detection by other methods of diagnosis. By pyelography it is possible to demonstrate not only the earliest stage of pelvic dilatation, but also the point of angulation

or of stricture which is often found to exist in the upper portion of the ureter or at the ureteropelvic junction.

My associate, Dr. Floyd E. Keene, who has charge of the cystoscopic investigation in my department at the University Hospital has until recently used a 10 per cent. collargol solution for the injections, with satisfactory results. More recently, however, he has employed a thorium nitrate method, as described by Burns, and has found it superior to collargol in that it gives a clearer picture, is a cleaner medium to work with, and is apparently free from the dangers that have been reported as following the collargol injection. The ureteral catheter is passed into the renal pelvis, and the character of the urinary flow is noted to determine the possibility and the degree of retention. The catheter is then withdrawn for 15 cm., and with the patient in the half-sitting posture the thorium solution is injected slowly by the gravity method. When the solution ceases to flow or the patient experiences the slightest sensation of fulness in the kidney region the injection should be discontinued and the picture taken. By this limitation of the symptomatology and the accurate checking-up of anatomical defects, neuroses of all types and cases of gastro-intestinal disturbances are excluded.

The advances made in surgery of the upper abdomen have in large measure exploded the pelvic reflex fallacies, for it has been amply proved that lesions of the pelvic organs that do not manifest direct symptoms seldom indeed give rise to persistent gastric reflexes. This is true also of gastro-intestinal reflexes of renal origin. Because of the close anatomical relationship between the right kidney, the duodenum, and the pylorus it is probable that an unduly movable kidney may occasionally be responsible for gastric disturbance. This is borne out by the cure of these disorders that occasionally follow an operation for nephroptosis with a direct renal symptomatology. On

the contrary, however, when the digestive disturbances are the sole symptoms, but few patients are cured by anchorage of a movable kidney. The occasional successful issue in which the gastric symptoms have been made the pretext for an operation is so rare, and the record of failures is so frequent, as to strengthen the conviction that such disorders should never, alone, serve as a surgical finger-board merely because a palpable movable kidney is present. By following this policy of absolute limitation we may fail to cure an occasional deserving dyspeptic, but, on the other hand, we will also certainly escape the ridicule and just criticism of the internist or neurologist for many surgical wrecks in which proper discrimination was not made.

For years we have measured the range of the renal mobility in all abdominal sections by slipping the kidney under direct touch to its lowest point of excursion and we have found repeatedly the most extreme mobility of the right kidney without a single attendant renal or gastric symptom. Notwithstanding the more rigid selection of cases within recent years, we find, on reviewing the results, that the percentage of cures among the cases traced is about the same. This at first sight is apparently at variance with the belief that a more rigid selective policy will yield better results. I believe that this uniformity of cures in our cases, however, is more apparent than real, and is due to the fact that a large percentage of women whom we have failed to trace were operated upon in the earlier days of this schedule of cases, when we were less discriminating in our surgical endeavors.

One cause of failure to effect a cure by nephropexy in a symptomatic nephroptosis may occur when there is chronic dilatation of the renal pelvis, with secondary renal changes, such as pyelitis or nephritis, and even though, as the result of the operation, the kidney is placed in a better functionating position, the pathological changes are too far

advanced to permit a physiological restoration to take place.

As to the method of operation, we have found the Edebohls plan, with slight technical modifications, to be the most satisfactory. In our earlier series of cases we employed the Brödel stitch successfully, but we were always under the impression that in sinking a triangular stitch into the renal substance we increased the hazard of an untoward operative result.

In operating according to the Edebohls plan the usual straight dorsal incision is made and the kidney is reached through the renal triangle, with a minimal amount of injury to the muscular structures. Great care must be exercised to avoid injury or ligation of the lumbar nerves. In one or two instances in our earlier experience this latter accident occurred, and a slow and painful convalescence was the result; in one case this distressing sequel dragged painfully on into months. The perirenal envelope is pulled well up and any redundancy is excised, so that when the suspension stitches are applied the tissue also secures the kidney as a suspensory medium through its hammock-like adjustment. In effecting decapsulation of the kidney we depart from the extensive method of Edebohls. Our plan is to split the capsule back on a grooved director to each pole of the kidney, but it is only slightly dissected loose from the organ, leaving a narrow band of exposed kidney substance about one-half inch wide. The extent of the decapsulation has thus been limited because experimental investigations and clinical experience have proved that the fibrous capsule that reforms after a total decapsulation is frequently the source of serious pathological changes. Three mattress sutures of silk or linen thread are inserted in the capsule on each side of the exposed dorsal surface of the kidney, and the perirenal fascial hammock, which is pulled up snugly about the

kidney, is transfixed. With a long, curved needle these sutures are carried through the lumbar wall to the surface and tied over small gauze bolsters. Because of the elastic tension upon these sutures the denuded renal surface is brought up into snug contact with the incision, thus creating a strong bond of fixation between these two surfaces when adhesions occur. The incision is closed in the usual manner and at the end of ten days the suspension sutures are removed.

About 50 per cent. of our cases have been examined at intervals varying from one to ten years after the operation, and in no case has a recurrence taken place. In one of our earlier cases in which a nephrorrhaphy was attempted by using the Brödel stitch the hemorrhage from one of the triangular stitches in the kidney was so severe that a nephrectomy was necessary to save the patient's life. This was the only immediate surgical complication of noteworthy importance occurring in this series of cases. One patient died of a pulmonary embolus ten days after operation. From what has been said it will be seen that the dangers of a nephropexy are slight and should not deter the surgeon from undertaking the operation provided his attitude is based upon a valid renal symptomatology.

Analysis of 50 Cases of Nephroptosis in Which Nephrorrhaphy Has Been Performed. In following up the cases which have been operated upon between 1900 and 1915 we have been able to secure full data from 36 of the 50 cases operated upon during this time. Divided into five-year epochs it would appear at first glance that the percentage of cures is about the same in all three groups regardless of the greater refinement of diagnosis and the more accurate restriction of the symptomatology to actual renal or vesical manifestations in the later series. This conclusion, however, is fallacious, for much the larger proportion of untraced cases falls within the first and

second five-year periods than in the last. Thus in 18 of the first group only 10 could be located; of the second 15 there were 11; and in the last 17 there were 14. As we review the first and second groups we observe that the indications for operations were at times at best rather vague, and not infrequently the nephrorrhaphy was performed as an incidental part of a combined operation, consisting of various pelvic, appendicular, and other procedures. Since 1910, the operations have largely been for the correction of a pathological nephroptosis *per se,* and the only additional operation has been, as a rule, the coincident removal of an appendix as a matter of precaution rather than necessity. We may, therefore, attribute a curative ratio of 70 per cent. in this group directly to the kidney suspension rather than to some one of three or four other coincident operations.

In other words, one might say that in our earlier experience a nephrorrhaphy was thrown in with the pelvic operations on the principle of giving good measure rather than because the kidney was the subject of direct pathological manifestations. In several of our earlier cures we may feel reasonably sure that this additional operation did neither harm nor good; whereas in some of our failures we are inclined to feel that the prolonged surgical manipulation in a neurotic individual has done positive harm. We particularly are impressed with this fact in the final summary of results. It is always salutary to review the bad results of our work in order to correct such faults in the future and to lay down fixed rules for a routine procedure applicable to a chosen group of cases.

First, as an example of a surgical error, I would cite Case 810, admitted to the hospital in 1903. The patient's chief symptoms were sharp pains in both ovarian regions, radiating down the left leg, headache, backache, *no renal symptoms.* The examination revealed a prolapsed left

ovary, prolapsus uteri partialis, lacerated cervix and perineum, and movable right kidney. For these conditions the following operations were performed: repair of the cervix and perineum, suspension of uterus, and right nephrorrhaphy. This case could not be traced, but regardless of the result so far as any benefit to the patient's health was concerned, in the light of our present knowledge one may feel assured that no benefit was derived from the additional nephrorrhaphy. In other words, this part of our operation was performed to meet an anatomical rather than a pathologic indication. In such an instance, if a bad result were to follow, the ill-chosen operation might easily have to bear the burden of a bad recovery. According to our present attitude we view such a procedure as meddlesome surgery, much more likely to be provocative of harm than good.

Our table of earlier cases reveals other instances of misapplied surgery, but we believe these errors have been less and less frequent during the last ten years. An operation without a clearly defined indication in a neurotic patient can only result in an untoward issue in the vast majority of cases, and it is for this very reason that we so urgently condemn the application of surgery to any organ unless a pathological state directly answerable to surgical measures is found.

We shall relate the brief summary of one more case of misapplied operation before passing to our later series, which stands upon a more equitable basis.

Case 1230, admitted May 9, 1904. Chief symptoms were pain in lower abdomen, especially in inguinal regions, and right renal area, increasing weakness, general nervous breakdown seven or eight years ago. Diagnosis: bilateral hydrosalpinx and right nephroptosis. The combined operation consisted of a right salpingo-oöphorectomy, left salpingectomy, partial left oöphorectomy, appendectomy, and right nephropexy. Again, in this instance, the patient

could not be located, but we do not hesitate to hazard the opinion that whatever the ultimate outcome in this case may have been that the nephropexy added no beneficial effect but possibly helped to topple the patient further over into the domain of chronic neurasthenia. We may refer to such cases as markers in the line of surgical progression, teaching the unerring lesson of what not to do.

In the evolution of this phase of surgery these cases have served as milestones or perhaps turning points in our experience, and have served a valuable purpose in limiting our endeavors to cases which offer a large percentage of curative possibilities with a minimum probability of untoward results and disastrous nervous sequelæ. All too frequently we still find this same class of individuals being advised by physicians of limited experience to undergo these unnecessary and therefore harmful operations, and quite as frequently surgeons who are willing to act as aides and abettors of this unwarranted procedure.

The paramount value of an accurate follow-up system is to detect the great as well as the lesser flaws in surgical work, so that those who follow may not fall into similar error. From our observation the one chief warning against a nephrorrhaphy in a neurotic woman should stand as a capital heading unless the renal symptomatology is clearly defined, otherwise such an operation cannot be deprecated too urgently.

In concluding, we append a table of the cases operated upon since 1910, the period during which we have endeavored to select only those of a true pathological nephroptosis. A summary of symptoms, with diagnosis, operation, and ultimate results, is given. While the results are by no means perfect they nevertheless represent a 70 per cent. restoration to active efficiency of the women operated upon, a degree of restoration which compares favorably with many other operations generally accepted by representative surgeons.

CASES OF NEPHROPTOSIS OPERATED UPON DURING THE LAST FIVE YEARS

Gynecological number, date of admission	Symptoms.	Diagnosis.	Operation.	Condition on discharge	Result
3462 Oct. 6, 1910	Constipation, flatulence; colicky pains in lower abdomen; lump in right side of abdomen; "knife-like" pain in kidney; cannot lie on left side; nausea when on her feet	Right hydronephrosis from nephroptosis	Suspension of right kidney; appendectomy	Surgical convalescence satisfactory	Growing better each day; doing housework and gaining strength; gained twelve pounds; numbness in right hip; never sick except occasional headache.
3510 Nov. 2, 1910	Backache; frequency and urgency of urination; pain in side	Right nephroptosis; retroflexion of uterus	Appendectomy; suspension right kidney and ovary; Coffey suspension	Surgical convalescence satisfactory	Greatly improved; constant desire to void has passed; pains across back, especially in the morning, but wears off later in the day; worse at periods.
3518 Nov. 10, 1910	Paroxysmal pain left side following pregnancy, relieved by voiding; mass in left side during attack	Movable left kidney	Suspension of left kidney	Surgical convalescence satisfactory	Could not be located.
3746 May 20, 1911	Pain in sacral region; weakness; easily tired; frequency of urination	Nephroptosis; periappendicitis	Suspension of kidney; appendectomy	. . . . .	Died suddenly from pulmonary embolus ten days after operation.
3806 Aug. 3, 1911	Pain in left kidney, radiating to bladder; slight hematuria after attacks	Hydronephrosis, due to aberrant artery; nephroptosis	Pyelotomy; nephropexy	Surgical convalescence satisfactory	Complete cure; no urinary trouble except two attacks of cystitis; does not gain in weight.
4130 Mar. 21, 1912	Attacks of "indigestion;" pain in right iliac fossa; urinary frequency; flatulence	Chronic appendicitis; movable right kidney	Appendectomy; suspension of right kidney (Edebohls)	Surgical canvalescence satisfactory	Cured.

4161 April 13, 1912	Lump in right side since a fall one year ago; tenderness in both sides	Right nephroptosis	Nephropexy	Surgical convalescence satisfactory	Cured; slight edema of feet since one year after operation; headache at periods.
4308 Aug. 20, 1912	Hematuria; pain in right side; nausea; nervousness; menorrhagia	Hematuria; uterine fibroid	Supravaginal hysterectomy; suspension of right kidney	Surgical convalescence satisfactory	Patient better and stronger in every way; tires easily.
4582 Feb. 12, 1913	Nausea after meals; epigastric distress	Cholelithiasis; movable kidney	Nephropexy; removal of gall-stones	Surgical convalescence satisfactory	"Intestinal trouble" and occasionally frequency of urination; more or less nervous—due to onset of menopause.
4692½ May 13, 1913	Pain and soreness in right iliac region and loin; nausea and vomiting; urinary frequency; epigastric distress after eating	Chronic appendicitis; cecum mobile; movable right kidney	Appendectomy; suspension of right kidney	Pain in kidney region	One year ago pain on left side, lasting four weeks; diagnosed as congestion of kidney; last summer attack of pain on right side with fever, lasting twelve days, diagnosed as gall-stone colic; occipital headaches with nausea and vomiting; nocturia but not as much as before operation; gained fourteen pounds.
4920 Oct. 17, 1913	Sharp pain, left costovertebral angle, referred downward and forward; backache; frequency, pain and burning on urination	Ptosis of left kidney; perinephritis	Suspension of left kidney; freeing of adhesions	Surgical convalescence satisfactory	Unimproved; says she is in constant pain; very garrulous concerning multiplicity of symptoms; extremely neurotic.

CASES OF NEPHROPTOSIS OPERATED UPON DURING THE LAST FIVE YEARS.—*Continued*

Gynecological number, date of admission.	Symptoms.	Diagnosis	Operation.	Condition on discharge	Result.
5019 Dec. 22, 1913	Constant pain in left lumbar region, radiating downward; nervousness	Left hydronephrosis	Nephropexy	Backache	Patient felt better and backache was hardly perceptible until pregnancy one year ago. Constant severe headaches during entire pregnancy; backache worse since confinement; also constipated, never having a natural movement.
5108 Feb. 12, 1914	Dragging pain on right side for two years, worse when standing	Right nephroptosis	Edebohls's nephropexy	Surgical convalescence satisfactory	Cured.
5262 May 26, 1914	Pain in left side; backache; nervousness	Left nephrotosis; retroflexion	Coffey suspension; appendectomy; left nephropexy	Surgical convalescence satisfactory	Much improved, but at times feels weak; pain in left side and back; menstruated twice each month for the past four months.
5509 Nov. 17, 1914	Sharp pain on right side of pelvis; frequent desire to urinate; pain intermittent and involving loin	Chronic appendicitis; floating kidney	Appendectomy, right nephropexy	Surgical convalescence satisfactory	No further sharp attacks of pain, but occasionally pain on bending or twisting; excellent health generally, except somewhat nervous.
5698	Bladder irritability; pain in lower abdomen	Movable kidney	Nephropexy	Surgical convalescence satisfactory	Marked improvement.
5751½ April 21, 1915	Lumbar pain on right side for four years; indigestion; dysmenorrhea	Movable kidney	Nephropexy	Surgical convalescence satisfactory	Kidney in excellent position; menorrhagia—seat of small fibroid; rectal tenesmus at periods.

Conclusions. 1. The kidney, particularly the right, is not a fixed organ, and even an excessive range of mobility is no certain index of a reflex gastric or nervous disability unless direct renal symptoms referable to the kidney itself are present.

2. The three cardinal symptoms of disturbed renal function are pain in the renal area, a urinary or Dietl's crisis, due to kinking of the ureter, or vesical irritability referable to the kidney of the affected side.

3. No diagnosis should rest solely upon palpation of even an unduly movable kidney or upon a definite symptomatology unless this is confirmed by a cystoscopic examination, catheterization of the ureters, and a pylograph to define the point of stricture or of kinking in the ureter and the degree of dilatation of the renal pelvis.

4. With this rigid method of exclusion and clear symptomatic definition the surgeon may confidently count upon securing 70 per cent. of cures and from 10 to 15 per cent. of improvements as the result of the operation.

5. The dangers arising from the injection of radiographic substances into the renal pelvis are very real if piston or excessive gravity pressure is employed during the injection. With slight pressure no untoward symptom has been observed in our series of cases.

6. In our hands the Edebohls method, with slight modification, has proved satisfactory as a permanent means of anchorage.

DISCUSSION

Dr. Herman J. Boldt, New York City.—There is no ailment in the gynecological specialty that has interested me so much as mobile kidneys, and I include mobile kidneys in the gynecological specialty because they are so frequently found in the cases of women who have gynecological complaints.

Those of us who are well acquainted with Dr. Clark would not expect anything different than that which we have heard

from him—painstaking, conscientious, just at all times, in making his selection and in forming his indications for surgical intervention.

I believe those who have made it a rule to invariably examine all patients in every respect as to the position of the kidneys, as well as the gynecological conditions, must have been surprised to see the comparatively large number of mobile kidneys, in some instances going down to the brim of the pelvis, in whom there were no symptoms referable to the kidneys at all. It is very important that these patients are not informed that they have mobile kidneys lest they then imagine symptoms that were not present previously. I believe that Dr. Edebohls was to some extent right, but to a greater extent wrong, in attributing gastric symptoms as reflex symptoms due to mobile kidneys. There is no question but what gastric symptoms may frequently occur in connection with mobile kidneys, but I do not believe they are entirely dependent upon mobile kidneys; also the question of an inflammatory condition of the vermiform appendix in mobile kidneys. I believe those of us who have made it a rule to invariably examine the appendix in operations when it was removed will have come to the conclusion that what seems to the pathologist as a chronic inflammation of the appendix is present in 90 per cent. of the patients operated on. That has been my experience, so that the kidney position itself is no indication of the necessity for an operation, but that we must consider these doubtful symptoms that have been called attention to by the essayist.

So far as the technic of operation is concerned, I have from the beginning used the technic which was advocated and spoken of by Dr. Clark. Of late years, in a few instances of patients upon whom I operated for mobile kidneys, the difference was slight. Instead of tying my suture, always using the lower rib, tying above the lower rib, instead of tying the suture externally over the bolster, I have tied it beneath the skin over the fascia which answers the purpose as well, and instead of using chromic catgut, I have used plain catgut which will be absorbed. I do not believe the main feature is the tying of the sutures, but the main point is decapsulation and keeping the patients absolutely and strictly upon the back and not allowing them to sit up, thus allowing with the aid of the anchored suture the raw surface to remain in contact with the opposing tissues to become fixed, and that should be the case for one week.

So far as the results are concerned, I am not in a position to speak definitely. I have not endeavored to investigate of late patients who have been operated on, so that Dr. Clark has by far the better advantage. I believe, though, the greater number operated on during late years have been completely cured of symptoms referable to the kidney, limiting the indications strictly, and not operating upon neurotic patients because they have mobile kidneys.

Dr. Howard A. Kelly, Baltimore, Maryland.—I did not hear the beginning of Dr. Clark's paper, but my conclusions as to the value of treating displacements of the kidney are very much in the same line as those he has drawn. The operative treatment of displacements of the kidney, like displacements of the uterus, has fallen into disrepute to such an extent that many men have abandoned this operation entirely. It is perfectly evident to me that this is due to the fact that both classes of cases have been treated indiscriminately. It should be borne in mind that the mechanical indication alone is no indication whatever. Given a pain in the renal region or even in the lower abdominal region on one side or the other, a great deal of value can be secured as to its cause by a thorough investigation of the urinary organs; (1) as to whether there is infection; (2) by *x*-ray to determine whether there is stone; (3) by catheterization and injection of the side affected to determine if a pain similar to that with which the patient is suffering is producable; (4) taking measurements of the capacity of the kidney to determine if there is dilatation of its pelvis. Where stone and infection and hydronephrosis are excluded, and with the pain definitely reproduced by injection, and where no pelvic inflammatory masses are made out, one can rely to a very great extent on the suspension operation on the kidney and in nearly all cases it will give relief. Some years ago Dr. C. F. Burnam and myself reported a series of 300 cases in our book on The Diseases of the Kidney, Ureter and Bladder.

As to the methods of operating, I have never seen hemorrhage of any consequence. I for many years have been following a plan of suturing which consists in placing a triangular stitch over the capsule of the kidney and taking in a little bit of the parenchyma. One stitch is placed near the upper pole, one near the middle and one near the lower pole of the kidney. This gives a firm fixation and is, I think, all that can be desired from the mechanical standpoint.

Dr. Guy L. Hunner, Baltimore.—I have been extremely interested in both of these papers. We can appreciate the importance of Dr. Mason's paper in a certain class of patients, attempting to take out life insurance and who are turned down because of a slight albuminuria. I personally remember one case of orthostatic albuminuria. Dr. Kelly will doubtless remember the case. The patient was a young woman from York, Pennsylvania, who had albuminuria from one side only. We repeatedly catheterized both sides and always got albumin from one side. Ordinarily we get a slight amount of blood in the urine, microscopic at least, but with special care we can catheterize without getting blood, and especially without getting albumin. This young woman showed albuminuria from the right side where she had a movable kidney. I am sorry I cannot give the details as to the after-results in her case.

With the fear of being considered having gone daffy on the question of ureteral stricture, I want to discuss 2 cases from this standpoint and try to impress upon you the importance, when you are making a diagnosis of symptoms being due to movable kidney, of being sure the patient has not a stricture of the ureter.

Dr. Kelly will recall a Mrs. C. that came to the sanitarium two or three years ago. Dr. Brown, one of our best men on urinary conditions, had found pus and blood in the patient's urine on numerous occasions after she had what seemed to be Dietl's crisis on the right side. Dr. Kelly, after careful observation of the patient, made up his mind that she had no special trouble in the kidney, but she did have relaxation of the outlet and retroflexion, and accordingly he operated, repairing the outlet and suspending the uterus. She got no benefit from this operation. Dr. Brown wanted to send her back to Dr. Kelly, but she would not go, and came to me for further investigation. I went into her case carefully; there was apparently nothing wrong with the kidney. I refused to do a fixation which Dr. Brown thought was essential in her case. I had in mind at the time the possibility of ureteral stricture, but I could not discover the evidence of it. Six or eight months later she came to me and she had a very definite indurated stricture of the ureter. I treated her and she improved on the right side, and about six or eight months later she came with exactly similar symptoms on the left side, and I found a stricture on that side. I have carried on dilatation treatment. She has been a very

obstinate case, returning every now and then with symptoms worse on one side, and then on the other. In the meantime I have had *x*-rays taken of her teeth which show several abscesses. Her tonsils had been removed some time before. I dilated each ureter up to six and two-thirds millimeters and she is getting along comparatively comfortably, but she is coming back after the first of the year and has promised to have the necessary work done on the teeth. I feel quite certain that if the teeth are the focus of infection, the strictures are being reinfected or irritated by toxins and dilatation is bound to be only temporary. I believe we cannot cure these cases of stricture of the ureter if they have infected tonsils or bad teeth back of the ureter inflammation.

Another case Dr. Kelly will remember that came under our observation fifteen years ago. The patient had a stone in the right kidney and had a postoperative hemorrhage. Dr. Miller was resident surgeon, and I was assistant. We brought her down at midnight and removed the kidney. She came to Dr. Kelly three years ago with pain in the left side. He investigated her condition carefully and put her down as a neurasthenic. She belonged in that class from the body formation standpoint and general attitude. Later Dr. Kelly referred her to me. I could not find anything wrong with the urinary apparatus. Six months later she developed hydronephrosis. The first time she came she had none. When she came six months later she had 18 c.c. content and I found a definite stricture of the ureter which was overlooked at the first visit. The hydronephrosis in spite of treatments, continued to increase until it got up to 32 c.c. My dilatation treatments were only temporary in their beneficial effects. Now she is a traveling saleslady and is in moderately good health and the kidney holds only 10 to 12 c.c., and I consider her condition due to the fact that we had four abscessed teeth removed in her case

Dr. Emery Marvel, Atlantic City, New Jersey.—I want to take this opportunity to express my appreciation for the courtesies extended me by the Southern Surgical Association, and too, to bear testimony supporting the observations of the essayists as to the benefit patients derive from the correction of this trouble when the symptoms complained of are definitely due to prolapsing kidney.

It is regrettable that a method for relief which yields such constant results should fall into disfavor. Perhaps, as explained

by the essayist and by Dr. Kelly, the cause for this has been the too eager operator. A displaced kidney is not responsible for all of the symptoms of a neurasthenic, nor does the correction of the displacement cure all of these cases. To fasten a movable kidney simply because it is movable is unwarranted; to fasten the kidney when it plays only a part in a group of symptoms is disappointing; while its correction, when most or all symptoms are due to the displacement, yields most satisfying results.

I would like to add to the indications, as expressed by the essayists, those of unusual weak spells, timidity, fear, nervousness and a tendency to melancholia.

I recall a case in which an eminent internist (Dr. Musser) argued emphatically against operation because the condition of the patient indicated melancholia. He pointed out that if I operated on her there was likely to follow a mental derangment which was evidently in progress, and that the operation would be held responsible should melancholia further develop, and it would give me a bad reputation. However, through the earnest solicitation of the patient and members of the family the application of the remedy was made, the kidney was fastened and that woman today is the wife of a clergyman who lives near Baltimore and she is doing serviceable work in his parish.

There are some mistakes which, as I look back upon them, could have been corrected or avoided. In the series of 34 cases—very small, and I mention it because it is so small which I have had, I recall my first case in 1900. At that time, it was a popular surgical procedure to transfix a kidney, which method is no longer in vogue. Both kidneys were prolapsed I transfixed one kidney with silver wire; the other with catgut. Dr. Edward McGuire who is here will recall the case. Subsequent to operation this patient was reported as doing very well and she did well for three years; but what has taken place since is what we might expect. These wires have been removed. Dr. McGuire tells me she has since become the mother of two children, and is taking care of her household work. The technic then was transfixing the kidney and serious consequences befell many cases. The Senn procedure of hammock swinging became a customary procedure. The worst of all, perhaps, due to the extreme cruelty and almost barbarous procedure in removing these hammocks. This method has not been referred to today, but I think it appeals to us as an objectionable procedure.

The method used by the essayist seems to me nearly ideal. In 1904 I carried on some experiments to ascertain the best means of bringing about suspension and at the same time insuring retention. We took a weighing spring scale, fixing the kidney to the scale by the ureter. Weights were attached in suspension by the several methods used to fasten a kidney. When fastened to the fat capsule the suspending strength was four ounces; the transfixed kidney would carry twelve ounces of weight suspension; the denuded capsule with a single suture put through and tension applied parallel with the fibers would carry but four ounces; that when we took a Broedel stitch, four bites forming a square or diamond and applied it to the denuded capsule, we could carry four pounds. Since then it has been my practice to denude the outer capsule of the kidney and tuck it with two Broedel sutures on either side, and then fasten the suture to the external fascia of the lumbar muscles. By such a method the kidney proper is not molested, the retaining capsule sutures can be so placed that when tautened will draw the kidney high in its normal position to be retained there and the wound closed by primary union.

Dr. John G. Clark (closing).—Concerning Dr. Boldt's part in this discussion, I would say that not infrequently one finds associated conditions which require coincident operative intervention. Appendicular symptoms associated with movable kidney is of rather uniform frequency. In many instances it seems wise in such cases to remove the appendix, thus guarding the patient against the possibility of leaving a condition behind which may give rise to subsequent trouble.

Dr. Kelly has raised the question of the method of suspension. Originally we followed strictly the plan laid down by Edebohls, namely, a complete decapsulation of the kidney. The premises which he assumed to be correct have been very definitely proved to be incorrect, for the subsequent capsule which forms about the kidney after its normal envelope is removed may become very tense and instead of furnishing a new vascularization may actually tend to constrict the kidney as well as fix it very densely. The second condition of the patient, therefore, may be worse than the first. Our plan has been to split the capsule from the dorsal ridge down to the poles of the kidney. The capsule is then deflected only sufficiently to leave a denuded area about one-quarter of an inch wide. Three mattress sutures are placed through this capsule on either side and are brought up through

the dorsal muscular tissue to the skin surface where they are tied over a small bolster of gauze. This brings the small denuded renal strip snugly against the dorsal incision, making a satisfactory suspension without dense fixation. The ultimate results are most satisfactory so far as the permanent retention of the kidney in its newly placed position.

Concerning the possibility of stricture of the ureter giving rise to symptoms similar to those of a movable kidney, I would say in reply to Dr. Hunner's discussion that my associate, Dr. Keene, who has charge of our cystoscopic work, guards against this danger in the following manner:

The ureteral catheter is gently pushed forward until it reaches the pelvis of the kidney. It is then withdrawn well down the ureter and then a thorium injection is given under slight pressure, stopping when the slightest pain is produced. We believe that pain in these cases is a very good guide to the dangers of over-distention—a very real danger which has been pointed out by many observers in experimental work. The moment the injection is completed in the *x*-ray room, a picture is taken and the fluid is at once drawn off through the catheter. In the last three or four years, under this plan, Dr. Keene informs me that there have been no case in which there has been distressing pains following the *x*-ray examination. With this method, if there is a stricture the fluid will be retained at the point of stricture and it is well-defined by the *x*-ray examination. Dr. Hunner is quite right when he points out the fact that a stricture is particularly likely to be overlooked in the presence of a floating kidney, the latter being considered the actual cause of the pain while the former is completely overlooked.

I wish to register a very decided dissent to the suggestion made by Dr. Marvel to include in my classification of indication for nephropexy those suffering from the series of symptoms which he has described. We look upon this class of cases as comprising the very worst possible risk so far as hope for a cure is concerned. Our experience falls to the ground if they are to be included, for it is this class particularly that cast such serious reproach upon surgical intervention. I can conceive of no more dangerous ground than this for the surgeon to occupy as it is this particular class of cases in which we have found our bad results. It is only by the clean cut estimation of the exact symptoms referable to the kidney that I believe we can hope for a very large percentage of cures following a suspension of the kidney.

CHLORIDE OF ZINC IN UTERINE HEMORRHAGE PARTICULARLY WHEN CAUSED BY UTERINE MYOMATA AND METRO ENDOMETRITIS OR FIBROSIS UTERI

By H. J. Boldt, M.D.
New York

Among the therapeutic agents which have been used successfully to combat uterine bleeding caused by myomata and chronic metro-endometritis, or, as this is frequently called, fibrosis uteri, the most prominent are *x*-ray therapy and radium. In cases of profuse bleeding, however, a surgical intervention is frequently resorted to and the uterus extirpated.

While I advocate surgical intervention in the greater number of fibromyomas, I do not approve of such radical measure if the uteri be not the seat of a neoplasm. Then, too, there are patients who will not submit to a surgical intervention. And it is from such patients that I have acquired my experience.

At the New Orleans meeting of this Association I spoke of the good results obtained in instances of endometritis with menorrhagia from the intra-uterine use of carbolic acid, and in some instances when the bleeding was very profuse and the carbolic acid was ineffectual, from the intra-uterine application of chloride of zinc.

Since that meeting my experience has been greatly

increased, and because I have found this form of therapy so very satisfactory, I take the liberty once more of calling attention to it, regardless of the fact that some of our younger brethren may feel inclined to denominate it as "tinkering therapy."

Marion Sims, who did so much to establish gynecology as a recognized specialty, and other leading gynecologists as well, made use of chloride of zinc to control bleeding in instances of inoperable cancer of the cervix, and proved it a valuable remedy in properly selected cases. In those days, before I utilized the galvanocautery, brought into extensive use by John Byrne, of Brooklyn, I too used chloride of zinc in a number of cases, but discarded it not only because of inability to limit its action but because sometimes a vesicovaginal or even a rectovesicovaginal fistula resulted, in my experience, if the cancer had advanced too far.

It seemed too radical, in my opinion, to subject a patient who had very profuse bleeding, either in the form of menorrhagia or of metrorrhagia, the uterus not being the seat of a neoplasm, to an extirpation of the uterus. I therefore commenced to experiment with varying strength of carbolic acid applied intra-uterine. In mild cases this sometimes gave a good result. Then I began to make my applications of longer duration by leaving a gauze strip—a tampon saturated with the medicament—in that part of the gauze that was to remain in contact with the corporal endometrium. This is done by wrapping an intra-uterine applicator syringe, such as is made according to my directions by the Kny-Scheerer Company and by Tiemann & Co.* The medicament is drawn into the small barrel of the

* The applicator syringe differs from the well-known Braun uterine syringe, in the cannula being thinner, because of the gauze to be wrapped around it, having but one terminal opening; it is made of silver and is somewhat longer.

syringe, and this is wrapped with a narrow strip of gauze. The cannula of the syringe is made of silver, from four to five inches long, with only a terminal opening, so that the medicament comes into contact with the endometrium from the fundus downward. To allow of the gauze being readily slipped off the cannula should be smeared with vaselin before the wrapping. The strip should be one to two inches wide, and the length should vary with the size of the uterine cavity, usually from twelve to twenty-four inches. When the gauze-wrapped cannula has been introduced into the uterine cavity a small quantity of the medicament, four or five drops (if chloride of zinc) is expelled into the gauze. Then the cannula is withdrawn slightly, and being used as a uterine packer, more gauze is put into the uterine cavity and more of the medicament is ejected. This process is continued until the desired quantity has been ejected into the gauze and the cavity packed properly. When enough medicament has been put into the gauze the top may be entirely withdrawn and the remaining part of the gauze packed into the uterine cavity with an ordinary smooth uterine applicator. It is essential that none of the medicament should come in contact with the cervical mucosa, especially if chloride of zinc is used, lest a stricture results. The remaining part of the non-medicated gauze strip is then used to tightly pack the cervical canal. It is frequently necessary to dilate the cervical canal with a cervical dilator to assure a ready packing with the gauze.

A string should be attached to the terminal part of the gauze strip to enable the patient to remove it herself at the time designated for its removal. A fairly large absorbent cotton tampon is placed in the vagina after insertion of the gauze. The time of removal of the intra-uterine tampon depends upon whether chloride of zinc or carbolic acid has been used. If carbolic acid, either pure or diluted with glycerin, is the medicament the gauze strip may be removed

after the lapse of a few hours. But if chloride of zinc, the time to elapse must be long enough to give it an opportunity to exert its action on the interior of the uterus, which is about three days. In case of severe abdominal pain, which may occasionally occur, ¼ of a grain of morphine is sufficient to give relief. It is very important to assure proper action of the medicament that the interior of the uterus be practically dry; that is, that no bleeding from it occurs when the application is made. When there is bloody oozing the packing of the cavity with styptic gauze for a variable time is the best method to overcome it.

Unless permanent amenorrhea is desired not more than from 5 to 10 drops of the strong solution, 50 per cent. or a somewhat larger quantity of a 10 to 20 per cent. solution should be used.

It has been found that one application of chloride of zinc, if properly made, once in four weeks usually suffices. This is to be repeated at such intervals until the wished-for result has been brought about. From four to twelve applications generally suffice. With twelve applications, or even a lesser number, it has been found possible to effect complete amenorrhea in very profuse bleeding from interstitial myomata. Some of these tumors in my experience were fully six inches in diameter. While they did not decrease in size, the symptoms disappeared and the patients improved in health. Since the bleeding stopped this was logical.

Chloride of zinc is made use of when the uterine bleeding is very profuse from a chronic inflammatory condition of the endometrium, whether the myometrium is involved or not. If the bleeding be not too profuse or too prolonged, carbolic acid suffices to bring about relief. Chloride of zinc is always used in instances of profuse bleeding when interstitial myomata of small size cause it. In large tumors of this character I have not used it, nor would I

advise its use, because, in such cases, I feel that it is more to the interest of the patient if one does not wish to use radium or *x*-ray therapy, to remove the tumor. By this latter statement I do not wish to be understood as favoring *x*-ray therapy in these conditions, since I myself have seen instances of cancer complicating the tumor.

Of course, it is understood that one should, always be sure, before using such treatment, that the bleeding is not caused by a malignant change of the endometrium.

This is a form of treatment that may be used in most instances by any intelligent physician, who understands gynecological diagnosis in his office; even the sometimes necessary cervical dilatation, to introduce the gauze wrapped cannula. But seldom have I found it necessary to do it, under gas-oxygen anesthesia, in a hospital.

DISCUSSION

Dr. Charles L. Bonifield, Cincinnati, Ohio.—I unfortunately did not hear the first part of Dr. Boldt's paper, but in a general way I would like to make a remark or two about it.

In the first place, the doctor says that we must be careful to make a diagnosis of the case and be sure there is no malignant condition in the interior of the uterus if we use the method he has described. In many cases, to make this diagnosis, it would be absolutely necessary to do a curettage, and curettage in and of itself will be treatment enough without the chlorid of zinc, not always, but oftentimes it is. To my mind it is a preferable procedure.

In the second place, I desire to call attention to the fact that we know that fibroids frequently undergo a malignant change about the time of the menopause. Of course, this is the cancer period of life, and cancer may develop independent of fibroid. If this treatment controls hemorrhage, it must do so by forming scar tissue. It must do so by destroying the endometrium and leaving a scar behind. Cancer is prone to develop in scars. To my mind that is not the best procedure. In other words, it seems to me the removal of these tumors surgically, either by

myomectomy or hysterectomy, has gotten to be so simple, so safe, and so uniformly successful, that bearing in mind the danger of cancer, in the great majority of cases, if the heart and kidneys will permit, this should be the treatment of these cases that produce hemorrhage enough to demand treatment.

Dr. John G. Clark, Philadelphia.—In discussing Dr. Boldt's paper, I will have nothing to say concerning the use of the caustic application which he has described. He has worked out a technic which I am confident in his hand will produce the results which he has described but I cannot help but feel that in the hands of anyone attempting to follow in his footsteps there may be serious danger. Any caustic fluid applied to the cavity of the uterus is difficult to control since the depth of penetration and the amount of caustic action are at best problematical. During the last two years we have subjected the class of cases to which Dr. Boldt refers to the use of radium. Our employment of this remedy is of course empirical, but our success with it has been remarkably uniform for we have thus far in no single instance had to resort to a hysterectomy after its application except in one case in which there was a mistake in diagnosis and the radium was applied following a dilatation and curettage in a patient with quiescent pelvic inflammatory disease. As has been observed by many after a simple curettage the infection immediately became active and ultimately terminated in a double pyosalpinx which required the removal of the uterus. In this case, the interior of the uterus showed no visible destructive effects either superficial or deep from the effects of the radium. In the remaining 67 cases we have applied fifty milligrams of radium for twenty-four hours and in no instance have we failed to bring on the menopause with a complete cessation of the flow in older women, or, in younger women to see the hemorrhage cease and the flow return to its normal periodicity. Our experience thus far has been so uniformly good that we look upon the success of this remedy with the greatest assurance and consider it almost a specific in controlling hemorrhage. We are always of course very careful to perform a curettage preliminary to the use of the radium in order to exclude positively any malignant condition. The pain incident to radiation is almost negligible; at most the patient may complain of nausea for twenty-four hours.

We never employ radium in cancer of the fundus because the surgical results are too good to run any risk from the use of a

problematical remedy. In the large fibroid tumors which are causing pressure and are associated with hemorrhage, we perform a hysterectomy, since, as Dr. Bonifield says, the operation is relatively a very safe one and the results are excellent. And further, in the larger tumors there is always the possibility of an error in diagnosis. There may be extensive adhesions associated with the fibroid and there may also be associated inflammatory conditions. We believe, therefore, that we are serving the best therapeutic ends in subjecting these patients to the routine operation, which has now been made classic.

Our experience is yet young in the use of radium for cancer and these hemorrhagic cases. In the latter, however, our results have been so uniformly good we are most optimistic as to the ultimate outlook. If our observations are ultimately verified it cannot be gainsaid that the application of fifty milligrams of radium for twenty-four hours and a stay of five days in the hospital without any danger from the treatment to the patient must in its results excel the longer stay of the patient after a hysterectomy with its attendant dangers, even though small, and its slower postoperative convalescence.

Dr. Thomas J. Watkins, Chicago.—Caustics would probably give the same results in case of hemorrhage at the menopause as results from currettage, in that the benefits would be temporary and the remedy would have to be repeated. For this class of hemorrhages radium seems to be the ideal remedy, as temporary or permanent amenorrhea is easily and definitely accomplished. With one or two applications of radium for this purpose is very superior to the *x*-ray, in that the patient is very much less disturbed, the number of applications required is much less, the results are more certain, and there is less danger of peritoneal traumatism.

In the treatment of fibroids radium is probably a good remedy for the small ones near the menopause. For the larger ones surgery is indicated on account of:

1. Uncertainty of diagnosis.
2. Possible complications as regards adhesions, etc.
3. Greater certainty of result.
4. As prophylaxis of malignant degeneration.

The danger of malignant degeneration is 3 to 5 per cent.; danger at operation is less than 1 per cent., which should make the indications definite.

Dr. Joseph Ransohoff, Cincinnati, Ohio.—Dr. Clark's remarks remind me that nothing is so probable as the improbable, and nothing so possible as the impossible. Like Dr. Clark, I hesitate to say anything concerning radium. We have fibroid tumors small in size, with very severe hemorrhages, in comparatively young women who object strenuously to having an operation. They want to know if they still have a uterus, and in every one of those cases one or two applications of radium has stopped the bleeding. I do not know of a single case in which hemorrhage has recurred after a second application of radium. We want to operate on large fibroids, yet I have seen one fibroid which extended well above the umbilicus and could not be operated on simply because the patient had an aneurysm of the aorta and was bleeding very profusely. In her case we used radium twice and the tumor disappeared, and the uterus returned to normal size. There was no recurrence of hemorrhage, but this woman died from rupture of the aneurysm two and a half years after the last treatment with radium.

Dr. Boldt (closing).—Dr. Bonifield is quite right when he says we have cicatricial tissue formed in the interior of the uterus as the result of our topical application.

I wish to say with regard to his point of bleeding occurring probably about the climacteric period, that is the particular class of patients in whom I get my best results. We must all recognize the one fact that not every patient is willing to be subjected to an operation. If a woman is willing to be subjected to an operation, there is no reason why she should not be operated on, and presuming I had a small myoma in a relative of mine, I would invariably prefer, if I had the radium to use, to use it from what I know of it, but unfortunately the general practitioner is not always in a position to place his patients where they can get radium, and then we must bear another feature in mind; there are a great many general practitioners who, while they are perfectly competent to use this treatment, do not want to send their patients away. In the few remarks I have addressed to you, I hesitated because they were not particularly given for the benefit of the members of this Association but they were written more for the general practitioner who is not in the position of our colleagues in large cities. If I had the opportunity as a general practitioner, and could send my patients to Dr. Clark or to Dr. Ransohoff, that would be the proper course to pursue, because there is no ques-

tion but that radium will do what it is said to do. In spite of the fact in many instances it fails, yet there is some proof in its favor and we cannot doubt the veracity of men whose integrity is absolutely unimpeachable. I for one will continue to use it.

With reference to the remarks of my friend Dr. Watkins, I do not think there is any particular danger of these topical applications causing a cicatrix or stenosis of the cervical canal, if there is not too much of the chlorid of zinc solution incorporated in the gauze.

That is the main feature. It took me a long time to master the technic. I had a case of stenosis in the early period; but this is a reliable treatment to use in many instances where there is no malignancy. But that is something we must always determine.

VALUE OF GENUPECTORAL POSITION FOR BASTEDO'S SIGN IN CHRONIC APPENDICITIS

By J. D. S. Davis, M.D.
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Bastedo described his test for chronic appendicitis in 1911, which consists in the inflation of the colon with air through a rectal tube. The tube is introduced ten to twelve inches through the rectum and the colon is inflated by means of an atomizer bulb. After inflation of the colon, pressure at or near McBurney's point produces tenderness and pain if the appendix is inflamed.

Bastedo, Hertz, Dreyer, Slawinski and Bischoff all say colon inflation is of great value as a diagnostic sign of chronic appendicitis. Rost claims the sign is positive in pathological conditions of the colon and that pain is produced at the appendix only when changes in the mesenteriolum is such as to bring the appendix into abnormal relation to the cecum.

Bischoff has found the test positive when the appendix alone was found diseased—the mesenteriolum normal. He says his patients give no sign of pain or discomfort from colon inflation after operation.

Goodman and Lueders claim that the test is not pathognomonic of chronic appendicitis and that there is no constancy in the results obtained with it.

I have had the experience of Goodman and Lueders, and would have given up the practice but for the knowledge I had gained in throwing fluids into the colon. When a patient is on the back the sigmoid is flexed in such a manner that fluid cannot be carried higher than the sigmoid. If the patient is placed in the knee-chest position and a rectal tube introduced into the rectum the sigmoid at once becomes inflated with air, straightens out, and fluid may be made to pass through the sigmoid up into the colon. So I came to the conclusion that my failures were due to my not getting the air to the head of the colon. About this time I had a patient who had a digestive disturbance in whom I suspected a chronicly inflamed appendix—I had inflated the rectum by the Bastedo method and failed to get pain on pressure over the cecum—I placed the patient in the knee-chest position and inflated the colon, which gave her an acute pain at McBurney's point.

When the patient was turned on her back, pressure over the appendix caused severe pain. Since this experience I have been in the habit of placing all my suspected chronic cases of appendicitis who do not give pain on pressure before colon inflation in the knee-chest position for air distention with uniform results. In every case in which pain was so induced an inflamed appendix was found at operation.

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SOME PROBLEMS OF URETERAL SURGERY

By William R. Jackson, M.D.
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The accidents of surgery often give us much concern and frequently make serious problems for our consideration. The correct solution of any surgical question or proposition is embraced or expressed in the methods of procedure that give the best and most satisfactory results to the patient.

The question of the best methods to relieve stricture of the ureter and to remove calculi therefrom is easily solved, but the problem of what is best to do when a ureter is accidentally severed or exsected during the operation of panhysterectomy is not so easy or simple.

Total hysterectomy for carcinoma and myoma of the uterus gives us an injured ureter more often than is determined at the time of the operation.

When the ureter is cut or exsected without immediate repair, urine begins to flow from the proximal end of the tube and accumulates until the pressure forces it externally along the lines of least resistance, either into the vagina or through the abdominal walls, eventually resulting in a ureteral fistula. When the ureter is accidentally ligated in continuity one of two things may occur:

1. Necrosis of the walls and extravasation of urine into the tissues.

2. Permanent closure of the lumen by fibrous tissue and ultimately the loss of kidney function on the same side.

It is interesting to observe that in many cases when the ureter is tied, either accidentally or designedly, the secretion of urine continues until the pelvis of the kidney and the ligated ureter above the ligature are distended to the point of tension or pressure equal to that of the blood-pressure in the kidney. When the tension of urine and blood is equal, secretion of urine ceases in the kidney whose ureter is ligated, and the urine in the "kidney pelvis" and ligated ureter becomes aqueous or serous, the urinary salts being absorbed. The question of viability of the renal secreting cells while under pressure of urine retained by ureteral obstruction is important. Observations on animals whose ureters have been tied show that the glomeruli of the kidney retain their power of secretion for two years or more, as seen, when the obstruction to the ureter is removed. The very thin lamina of kidney cortex in hydronephrosis has shown secretory activity, when the obstruction is removed, eight or ten years after the inception of the complete blocking of the tube. As already stated, injuries to the ureter by cutting, bruising with forceps, laceration, or ligature are not always perceived at the time of their occurrence, their presence being manifested after the operation, either early or late, depending upon the character of the trauma.

When a urinary fistula follows an operation it becomes necessary to locate the leak, whether it be in the bladder or ureter. This can be done in most cases by catheterization of the ureters, the catheter meeting obstruction in the injured ureter, and a diminution of urinary flow on the injured side. Many errors have occurred in this work: the bladder may be the leaking point and the ureteral catheter show an obstruction of an old angulation or stricture or stone; or the catheters may pass up into the pelvis of the kidney, without hindrance, and yet the ureter have a small hole in it. Thorough cystoscopic examination of the bladder will reveal any opening in that organ.

Injuries to the ureter may be classed as low and high: those near the bladder, within six inches of it, being the low and most frequent, and those above this point to the kidney being high and less frequent.

If during an operation of hysterectomy for carcinoma of the cervix the ureter is severed in its lower portion the uterus should be removed before any attempt at repair of the ureter is made; this gives more room and less liability of injuring of the repaired organ.

The rule is to do an anastomosis, either by the end-to-end or end-to-side method; if it is not feasible to anastomose the cut ends, then an attempt to plant the ureter into the bladder is the next step; this may be done by splitting the ureter and opening the bladder and suture each half of the split tube to the bladder wall, thus preventing contracture of the orifice of the planted ureter. In some cases in which the ureter is too short, either Witzel's operation of elongating the bladder or Boari's operation of cutting a strip of bladder tissue wide enough to make a tube of and long enough to connect with the end of the ureter above, then sewing the strip into the tube, then suturing the bladder up. When so much of the ureter is destroyed as to make it impossible to do either an anastomosis or ureterocystostomy, then it becomes necessary to implant the ureter into the rectum (uretero-intestinal anastomosis); the mortality of this procedure is very high, because of the danger of infection by colon bacilli; by using the flap method this danger is somewhat diminished.

When the injury to the ureter is high up and it is impossible to do an anastomosis of any kind, the choice of procedure will be difficult to make between anchoring the ureter to the skin of the lumbar region with subsequent nephrectomy and that of doubly ligating the proximal end and leaving it in the abdomen. Of the two procedures I prefer to doubly ligate the ureter and take the chances

of its necrosing and leaking. By using large chromic gut, or large soft silk, and tying not so very tightly, in two places, we get better results than by tying with one ligature. Should the ligatures cut through a urinary leak will occur soon, then nephrectomy will be indicated, provided the other kidney is doing normal work.

The procedures, in order of preference, for a severed ureter during hysterectomy are as follows:

1. End-to-end or end-to-side anastomosis by any of the methods—Van Hook, Poggi-Robson, Bovée.
2. Implantation into the bladder—by methods of Witzel, Boari.
3. Implantation into the intestine.
4. Double ligation of the ureter.
5. Anchoring ureter to skin of the abdomen or back, with subsequent nephrectomy.

If it develops that the ureteral fistula is not discovered until several days after the operation that produced it, good judgment would dictate that nothing be done to remedy it until the operation wound has entirely healed—unless the patient's life is jeopardized by sepsis from urinary origin—then the kidney on the affected side should be removed immediately as a life-saving measure. The following cases will aid in elucidating my subject:

Case I.—F. C., aged thirty-six years, was operated for large fibromyomata of the uterus with the cervix much enlarged. A section of the ureter five inches in length was excised with the tumor. The patient being very weak and much shocked, no time could be devoted to anastomosis or implantation, so a double ligation was done and the ureter stump retained in the abdomen. The patient ran a very high temperature for seven days and developed a swelling on the side of the ligated ureter in the region of the kidney—this swelling remained for one month or more, when it gradually receded or subsided until no tumefaction

could be determined. The patient was perfectly well in three months.

Case II.—F., colored, aged forty years, was operated for large fibromyomata of the uterus, at which time the ureter was accidentally ligated and cut for an artery; the ligature was immediately removed and an end-to-end anastomosis was done by the Poggi-Robson method. The patient had an uneventful recovery.

Case III.—F. W., aged forty-nine years, was operated for carcinoma of the uterus (cervix). Complete hysterectomy was done; about two weeks after the operation, the wound being entirely healed, a urinary fistula occurred in the upper part of the vagina. It was a question to me where the fistula arose. Was it due to injury (bruise), or was the ureter cut or ligated and urine delayed in its escape externally? Ureteral catheterization showed the injury was in the ureter and not the bladder. The patient refused further operation for the closure of the fistula, which has continued for the past five years.

Case IV.—F. W., aged forty-nine years, was operated for myomata of the uterus. The tumor, together with four inches of ureter, was removed, and because of the great shock no effort was made to do an anastomosis; but the ureter was tied tightly with small silk and dropped into the abdomen. The patient developed a urinary vaginal fistula in about three weeks, but declined to submit to further procedure.

Case V.—F. W., aged thirty-eight years, was operated for cervical carcinoma; ureter was excised, four inches in length. Ureter was tied singly with No. 3 chromic gut and left in the abdomen. In two weeks a urinary fistula developed in the abdominal wall. This fistula continued for over a year, when a fatal metastasis occurred.

Case VI.—F. W., aged thirty-four years, operated for large fibromyoma of the uterus. The tumor and three

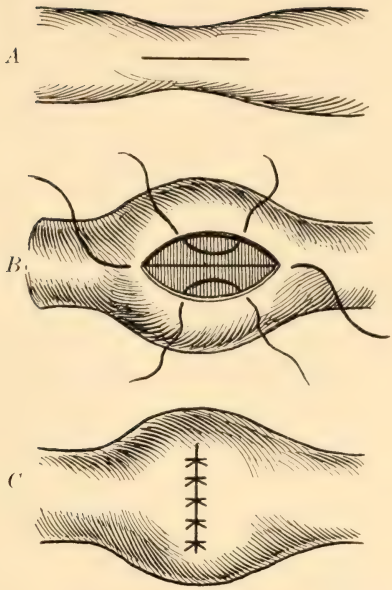

FIG. 1.—Operation for stricture of ureter: *A*, longitudinal cut; *B*, sutures passed; *C*, incision closed at right angle to lumen of ureter.

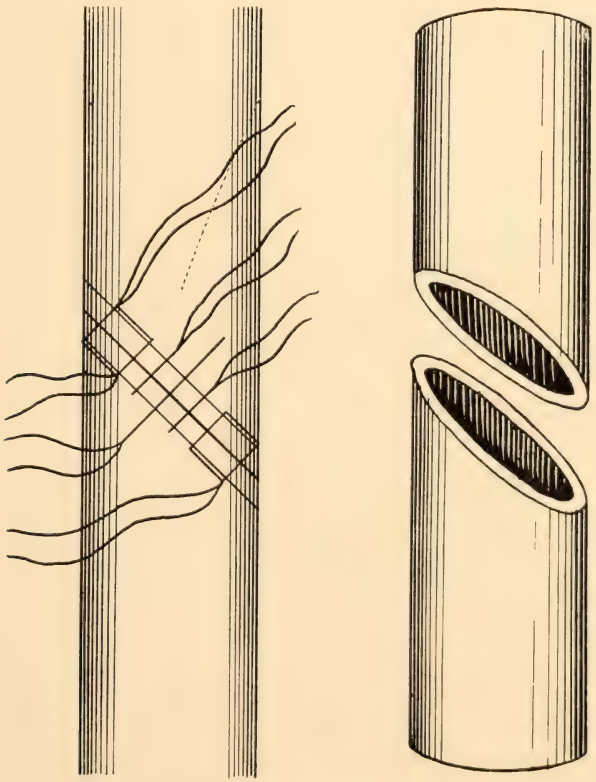

FIG. 2.—Bovée's anastomosis.

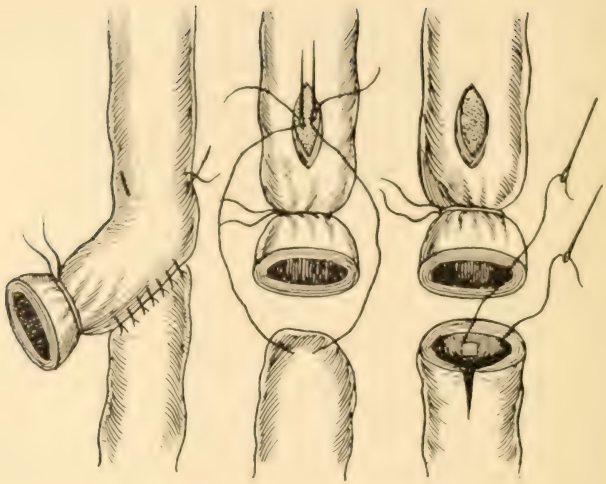

FIG. 3.—Van Hook's operation.

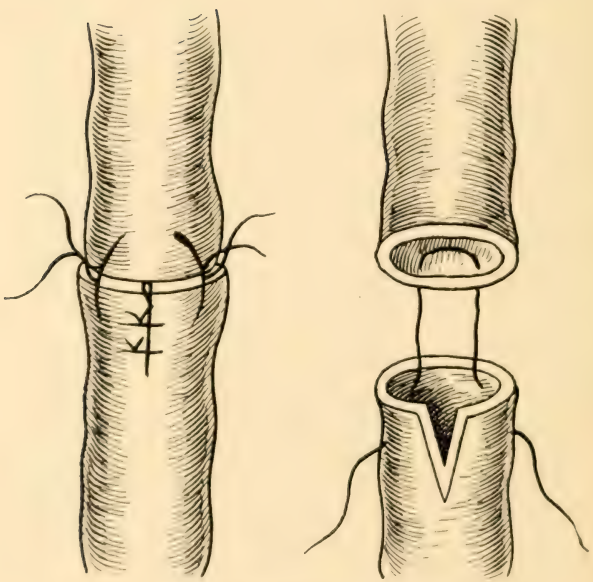

FIG. 4.—Poggi-Robson's operation.

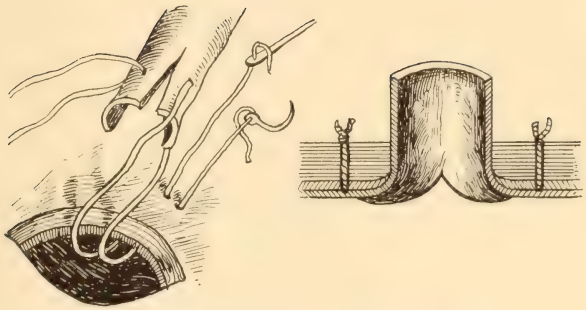

Fig. 5.—Transperitoneal ureterocystostomy.

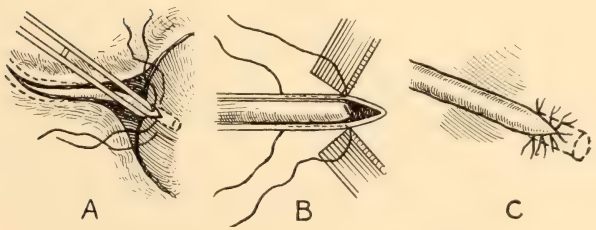

Fig. 6.—Ureterocystostomy.

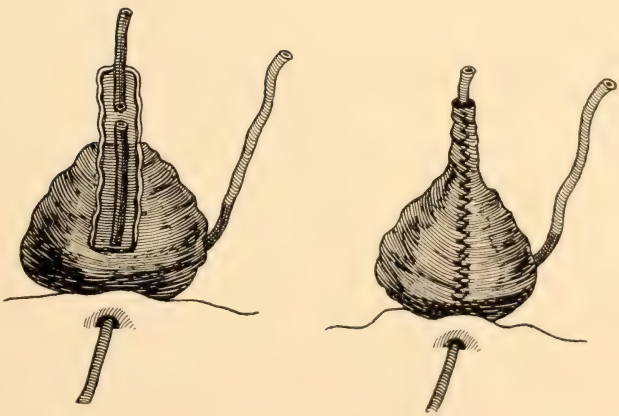

Fig. 7.—Boari's operation.

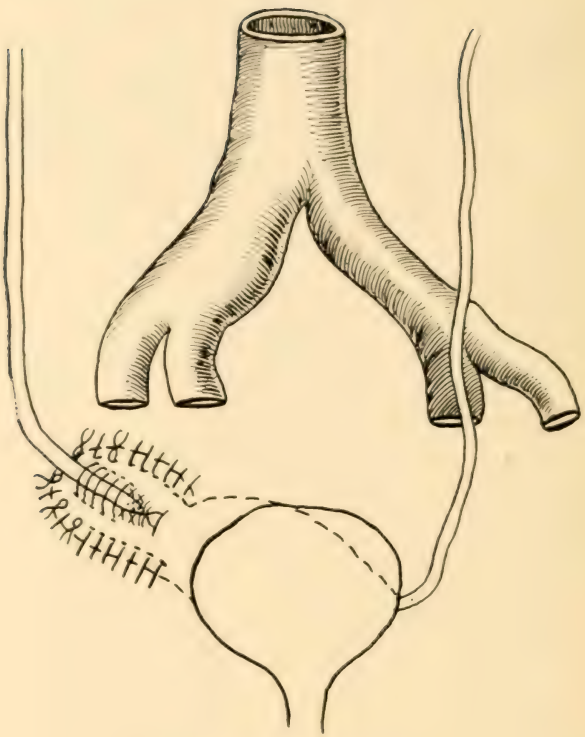

Fig. 8.—Witzel's operation.

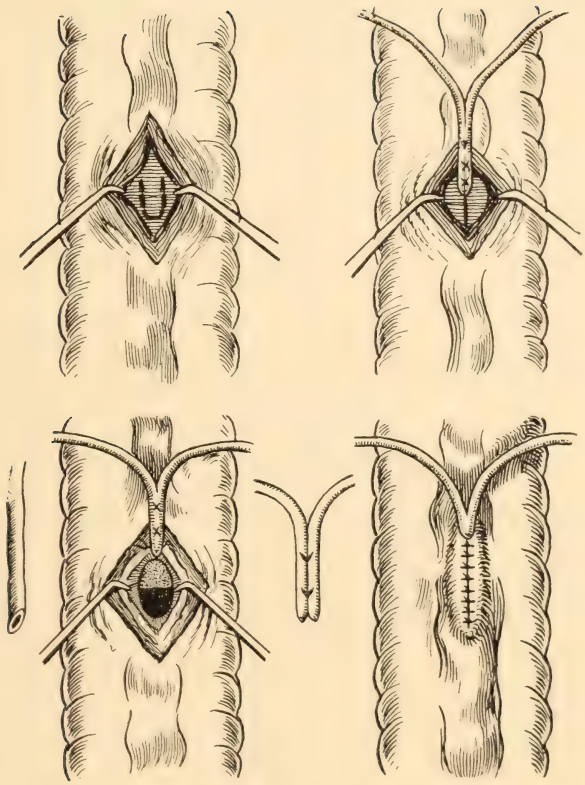

Fig. 9.—Ureterocolostomy.

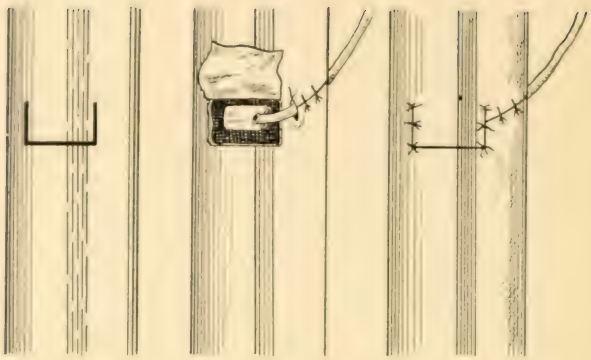

Fig. 10.—Ureterocolostomy; flap method.

Fig. 11.—Double ligation.

inches of the ureter was removed. The proximal end of the ureter was implanted into the bladder. The patient made a good recovery.

Case VII.—F. W., aged forty-four years, was operated for cervical carcinoma. The uterus with four inches of the ureter was removed. The proximal end of the ureter was doubly ligated with No. 3 chromic forty-day catgut and left *in situ*. The patient was well in two weeks. There was no swelling of kidney on the ligated side.

Case VIII.—F. W., aged forty-eight years, was operated for fibromyoma. The tumor with a piece of the ureter two inches long was removed. The ureter was anastomosed by the Boveé method. The patient developed a urinary vaginal fistula in ten days. Two months later an attempt was made to reanastomose, but the distal end of the ureter was too much contracted to do either an end-to-end or end-to-side inosculation. A double ligation was done, the patient making a good recovery.

Technic. The transperitoneal route is easier of performance than the extraperitoneal, and is the one of choice when implantation into the bladder or intestine is contemplated. Extraperitoneal procedure, either by the median abdominal or the Pfannenstiel, is less liable to infection.

Always cover the point of anastomosis with a cuff of peritoneum or a strip of omentum to prevent immediate leaking. Fine silk on a round, curved needle should be used for the suturing of the ureter. Chromic forty-day catgut is used in doubly ligating the ureter, the ligations being half an inch apart. Drainage of rubber tissue or soft rubber tube should always be used.

Summary: 1. Injuries to the ureter during hysterectomy are more frequent than is perceived at the time of the operation.

2. Discovery of the injury to the ureter is more often made several days after operation than at the time of it.

3. Difficulties of repairing the injured ureter are greater than they seem.

4. Injury to the ureter during a hysterectomy often means the sacrifice of the kidney of that side and sometimes the death of the patient.

5. It is better not to attempt to repair the ureter if there is serious doubt of its accomplishment. Even if the operator is an expert, attempts at repair frequently result disastrously. Removal of the kidney would be better under such circumstances.

6. Do not remove a kidney to cure a leaking ureter until you are sure of the presence of a perfectly sound kidney on the opposite side.

7. It is frequently better to doubly ligate the ureter than to attempt to do an anastomosis. Before ligating it is well to ascertain if a kidney is present on the other side.

8. When ligating the ureter the tension of the ligature should not be so great as to cut through the walls of the tube, but just sufficient to close the lumen of the ureter. The ligatures being placed half an inch apart causes the ureter to close and become a solid fibrous cord.

9. When the ureter is tied without crushing its walls, urine is secreted by the kidney on this side until the urinary pressure is equal to the blood-pressure in the kidney, then the secretion ceases and the urine changes its composition, the salts being absorbed and the contents of the kidney become hydrous or serous.

10. The destiny of a kidney whose ureter is tied is not easy to foretell. Ligating an injured ureter is better than removing the kidney, because the hormones of the kidney are retained when it is not extirpated.

URETER STRICTURE IN WOMEN; REPORT OF FIFTY CASES

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Ureter stricture or narrowing of the ureter lumen due to intrinsic inflammatory changes in the ureter wall is a disease far more common and of vastly more importance than the literature or our previous experience has led us to believe.

In a preliminary paper read before the Genito-urinary Section of the New York Academy of Medicine in January, 1916,[1] the author reported 50 cases of ureter stricture occurring in his practice up to November 1, 1915. In the same period of thirteen years of practice there were records of 49 cases of nephrectomy for tuberculosis and 39 cases of stone in the ureter. In the year from November 1, 1915, to November 1, 1916, or since becoming alive to the importance of the subject, and since looking for stricture, talking stricture, and having confrères refer suspected cases for diagnosis and treatment, the author has seen 42 additional cases.

This paper will deal in a statistical manner with the first 50 cases only, although the general conclusions will be based on an experience with 92 cases.

Etiology. Up to within the past few years most of the literature on this subject has been devoted to the so-called congenital stricture of the ureter.[2] [3]

Kelly[4] anticipates our more modern literature of the subject by stating that "strictures are caused by an inflammation in the ureteral walls produced by the commoner pyo-

genic cocci, by the gonococcus, and by the tubercle bacillus. The commonest form of inflammation is that due to the tubercle bacillus, and the rarest in my experience in women is due to the gonococcus."

Garceau,[5] on the other hand, says, after reviewing the literature, and in the light of his own experience, "the chief cause of fibrous stricture is gonorrheal infection."

Furniss[6] takes definite issue with the prevailing opinion that most ureter strictures are congenital in origin and, from a study of his cases, concluded that infection plays the important part in the production of ureteral stricture. He concludes that the infiltration in the ureter is resultant on acute hematogenous infection of the kidney, which often persists as a pyelitis, ureteritis, or secondary cystitis.

Furniss quotes Sugimura[7] as having studied the lower end of the ureters in the bodies of 25 patients who had had cystitis but died of other causes. He found changes of an inflammatory type in the submucosa and muscularis and was of the opinion that the infection extended through the lymphatics and not along the mucosa.

Necker[8] exhibited before the Deutsche Gesellschaft f. Urologie, at the Congress in Vienna in September, 1911, pyelograms of cases of pyelitis, all showing some dilatation of the renal pelvis, and in explanation said that they were cases of ureteral obstruction with secondary infected hydronephrosis.

Kelly and Burnam,[9] speaking of traumatic stricture, voice our common experience in stating that "traumatic stricture of the vesical end of the ureter following the injuries of labor and of surgical operations, especially the Wertheim operation for cancer of the cervix uteri, is quite common. As a rule, the trauma has so interfered with the blood supply of the organ that there are lateral necrosis, a continuous leakage of the urine, and ureterovaginal fistula. The spontaneous healing of such a fistula, almost invariably, means stricture."

Gunshot and stab wound injuries are rare. Morris[10] collected reports on five such injuries. Fig. 1 shows a stricture resultant on gunshot injury and giving rise to symptoms eight years after the injury and recovering after two dilatations.

Severe traumatic accidents as the cause of stricture are rare, just as one would conclude from the anatomy of this long flexible organ, well protected along the spine and attached at either end to a movable organ. Any accident severe enough to rupture the kidney or bladder or to crush the bony pelvis might well result in ureter stricture, but the history would be such as to suggest the etiology in a case of this nature.

Syphilis should be kept in mind as a possible cause of ureter stricture.[11]

Ureteritis cystica may cause ureter obstruction from the large size of some of the cysts, but this condition, while probably of inflammatory origin, cannot be classified as ureter stricture.[12]

Gynecologists might question the possible relationship between infected cervical glands and ureter stricture. As we shall learn later, the vast majority of these strictures occur in the broad ligament region, and it is but natural that we should suspect the cervix as having a possible causal relationship.

It is probable that ureter stricture occurs more frequently in women than in men and one is inclined to attribute this to the infections incident to childbirth. Opposed to this theory is the fact that in a considerable proportion of cases the symptoms of stricture begin in childhood or occur in women who have never married and in whom we have no reason to suspect a gonorrheal infection. Our failure to recognize the disease in both sexes has undoubtedly been due to our ignorance of its frequency and consequently to a failure to look for the lesion.

While I have not seen reason in any individual case to

attribute ureter stricture to a cervical infection, I have become suspicious of the etiological relationship between focal infections and certain cases of cervicitis. We have a type of urethral inflammation in which the vulva and paraurethral glands are inflamed and the patient has an inflamed cervix furnishing considerable leucorrhea. This type of inflammation is particularly likely to occur in adult maiden women, who show no other evidence and give no history of onanism or of gonorrheal infection. I think that time will demonstrate that the group of inflammatory foci in the pelvis is secondary to a distant common focus of infection.

The frequent association of ureter stricture and venous phleboliths in the immediate neighborhood speaks for a common origin for the inflammatory process resulting in the two conditions and suggests that some of these infections may have originated in the genital tract.

While we must admit the possibility and probability of any of the foregoing factors playing a role in the etiology of certain ureter strictures, I am firmly convinced that the majority of ureter strictures, excluding those of tuberculous origin, should be classified as simple, chronic stricture, and that they have their origin in an infection carried to the ureter walls from some distant focus such as diseased tonsils, sinuses, teeth, or gastro-intestinal tract.[13] This conception of stricture postulates that in the majority of cases ureter infiltration is primary, and that the other urinary tract lesions so often associated with stricture, such as stone in the ureter, hydronephrosis, pyelitis, and pyelonephrosis, are secondary.

As reported in my first paper on "Chronic Urethritis and Chronic Ureteritis Caused by Tonsillitis," read before the 1910 meeting of the Southern Surgical and Gynecological Association at Nashville, and as borne out by considerable experience since that time, I have the proof that certain obstinate cases of chronic urethritis, which will not heal under the ordinary methods of treatment carried on over a

long period of time, will promptly become absolutely well by getting rid of the distant focus of infection.

In the case of ureter stricture it will probably take some years of experience before we can claim to have satisfactory proof of the above thesis. Not only must we collect a large number of cases similar to Case 7, reported in the above paper, whose symptoms of ureter stricture began soon after an attack of tonsillitis, but we must have a series of cases of ureter stricture in which relief fails through a long period of treatments and is then obtained after the distant focus of infection has been discovered and corrected.

I have a few cases who have persistantly refused to show material improvement in symptoms until after removal of the infected tonsils or teeth, and another list of cases who have been dismissed as well after dilating the strictures or after getting rid of the pyelitis by dilatation of the stricture and lavage, and who have returned with their old symptoms after a fresh tonsillitis attack or after undergoing dental work.

Symptoms. *Pain.* Pain is the most universal symptom of ureter stricture, and only in rare cases is there absence of pain. To attempt to draw a pain chart of this affection one would need a diagram of the human frame extending from the diaphragm to the ankles. The most deeply shaded portion of this chart would center in the local area of ureter inflammation, or, in other words, in the broad ligament region deep in the pelvis.

In my preliminary paper above mentioned, as read in New York, I said: "It is comparatively rare to have our attention directed to localized symptoms due to the stricture. The patient usually complains of pain in the kidney region or of bladder symptoms or of both, and the stricture is found in the attempt to fathom the cause of the symptoms."

This statement was made on a study of my first 50 cases seen at a period when ureter stricture as an entity was not in mind. Many of those cases came late when the kidney

lesion was advanced and overshadowed other conditions. Since making that report, and realizing the importance of ureter stricture, better histories have been obtained, and it is rare to find a patient with stricture who does not complain of a pain or of a nagging discomfort in the site of the ureter inflammation.

From this center of inflammatory discomfort in the pelvis the pain may radiate in any direction, upward toward the kidney, laterally into the hips or groin region, posteriorly simulating a sacro-iliac joint condition or a sciatica, and downward into the thigh and leg either posteriorly or anteriorly.

Next in frequency to the local ureter pain is pain in the kidney region. This is probably at times a referred pain from the inflammatory area in the ureter, but it is usually due to overdistention of the kidney pelvis.

At times, on passing the renal catheter and impinging against the tender stricture area with the wax tip and again with the wax bulb, the patient refers the pain upward to the kidney region.

The kidney pain is usually elicited only by injecting the pelvis to overdistention. Frequently we get the history that the patient suffered at first with a more or less constant pain low in the abdomen, and that she later developed intermittent attacks of pain in the kidney region. Early in the patient's history these intermittent kidney attacks came on only at the menstrual period or on getting the feet wet, or having some unusual exposure, which conditions would favor the swelling shut of an already narrowed area in the ureter. Later the pain in the upper flank or lumbar region may occur at frequent intervals or become as constant as the ureter pain.

Occasionally the pain occurs first in the kidney region and develops later in the lower abdominal quadrant or region of the ureter stricture, as was the case in the patient illustrated by Fig. 10.

Actual pain in the bladder occurs only in the exceptional case, and it is probably a referred pain from the kidney, as it accompanies the severe acute renal attacks simulating stone in the ureter in which there is likely to be both bladder and rectal tenesmus. Fig. 2 illustrates such a case in which two attacks of renal colic were accompanied by very bloody urine and were controlled only by repeated hypodermics of morphin.

Discomfort in the bladder and frequency of voiding are not at all uncommon with the intermittent renal attacks, and these symptoms may be present in cases complaining only of the ureter pain.

Urine Examination. The urine may be quite negative on repeated careful centrifuging and microscopic search. If there is an associated pyelitis the urine shows the pathological features and variations common to that condition. If the urine is not infected we may still find a few leukocytes or a few erythrocytes or both. These may come from an ulcer area at the site of stricture or we may find them increased in number after one of the acute kidney attacks, when they probably result from the trauma to the kidney pelvis.

Fever. Chills and fever are common in the cases with urinary infection. A case with infection may go for weeks or months without chills or appreciable fever and may suffer only a malaise and general depression. Given any condition causing the stricture area to close and the patient develops fever, often with chills, pain, and general prostration as usually seen in acute pyelitis.

It is important to note that a patient may develop fever even of a high grade without infection of the urine and with only one ureter involved. The urine may be quite normal or there may be a few erythrocytes. The kidney is enlarged, tender and painful. A few of the cases with sterile urine have shown a slight daily rise of temperature and these are likely to have nausea, headache, or other uremic symptoms.

One patient with a daily rise of temperature of 99° to 100° extending over a period of four weeks and a leukocytosis of 19,000 reducing in the same period to 12,000 had a normal temperature and leukocyte count of 10,000 ten days after tonsillectomy.

Miss X., aged twenty-two years, nurse at the Hebrew Hospital, was awakened one Friday morning with a severe cramp-like pain in the right kidney region extending downward and forward to about the pelvic brim region. She had several attacks with severe pain and nausea and vomiting, but kept on duty until the following Monday, when she reported to the superintendent of nurses that she could not continue with her work.

The first attack came on at the end of a menstrual period. For two nights before the attack she had been up frequently to void, and had too frequent voiding up to the time of entering the hospital as a patient.

Drs. Adler and Hirsh were called to see the patient, and because of the character and location of the pain and the presence of microscopic blood in the urine they considered the case one of stone in the kidney or ureter. *X*-rays were negative, and they called me into the case on October 20, the twelfth day of her illness.

Because of a daily rise of temperature to above 99° and a leukocytosis of 19,000 with high percentage of polymorphs, we considered seriously the possibility of an appendicitis, with a high posterior position of the appendix to account for the pain phenomena. The presence of the above signs and symptoms without pus in the urine argued against a kidney lesion. Blood in the urine is not particularly rare in appendicitis. The patient's pain was more pronounced and more prolonged than one usually sees in appendicitis. The patient was rather stout, and, considering the possibility of the *x*-ray missing a stone, I catheterized the kidney with a wax-tipped bougie. This came back without scratch marks. The meeting of the catheter tip with the pelvis of the kid-

ney caused an increase of the patient's pain, which she likened to her former pain. The injection of the pelvis of the kidney also exaggerated her former pain, and the pelvis seemed to be rather smaller than normal, returning only 6 c.c. after dilating to discomfort. This test of the kidney was followed by three days of intense pain instead of the usual few hours of discomfort caused by such examination. The patient had to be chloroformed several times to control the pain. The temperature conditions and the leukocyte count remained about the same.

In view of the pain phenomena during catheterization and the great increase in pain after the catheterization I became more convinced of the possibility of ureter stricture, although there had been no apparent obstruction to the catheter. The possibility of stricture had been in mind from the first, when, on taking the history, I found that the patient had been troubled with her tonsils from time to time all her life, her last definite attack having occurred in March, about eight months previously. Another factor in favor of ureter stricture was the presence of a dense stricture of the urethra. The tonsils appeared normal on examination.

One week after the first catheterization I again catheterized, this time using a wax bulb. Again I could not detect obstruction, but the bulb must have had a beneficial effect, for the patient did not have the severe pain reaction. Again, the kidney pelvis seemed rather smaller than normal.

A week later it was time for the patient to menstruate, and she was having increased pain in the kidney region. On catheterizing with the wax-bulb catheter I did not detect obstruction, but the wax-bulb, which was made of white wax and olive oil, equal parts, was partially mashed on withdrawal. A test of the pelvis of the kidney at this time, when the patient was about to menstruate and was having increased pain in the kidney region, showed a capacity of 11 c.c. as compared with 6 c.c. on the two former tests. A week later, or five weeks after the beginning of the patient's

symptoms, my wax bulb was definitely obstructed at a point about 3 cm. after entering the ureter, and on its withdrawal it was so hung in the stricture area that I feared it would drag off the catheter. Fortunately I had a bulb of pure wax on this occasion, and it returned intact. After this catheterization the patient had considerable pain for an hour or two, due to the trauma of dilating the stricture of the urethra and of the ureter. There was none of the increase of kidney pain as on former treatments. A few days later I again dilated the ureter stricture with a wax bulb of about 4 mm. diameter, and then referred the patient to Dr. Lee Cohen for tonsillectomy. Dr. Cohen reported that on superficial examination the tonsils appeared healthy, but at operation they were found to contain large lacunæ of free pus.

Gastro-intestinal symptoms are common. They are probably of twofold origin arising either as a central nervous system reflex or as a result of toxic absorption. We see the same phenomena in certain cases of stone in the ureter and in cases of ureter blockage from any cause.

The symptoms vary from a slight nausea or aversion to food, to the most extreme and persistent nausea and vomiting leading to threatened starvation. Gaseous distention is a frequent symptom. Occasionally there is complaint of rectal tenesmus and desire to stool. Pain just before or during stool is present in some cases, and is probably due to the fecal matter passing over the tender peritoneum at the site of the ureter inflammation.

Case 66 (Fig. 3) learned by experience that it was more agreeable to omit the meal preceding the dilatation and lavage, otherwise she lost the meal by vomiting.

Case 65 (Fig. 4) had suffered for a year with repeated attacks of diarrhea and had lost forty pounds in weight. Dr. Barker found that she has an associated achylia gastrica, and she was given the dilute hydrochloric acid treatment. After dilatation of her ureter strictures her diarrhea attacks ceased and she gained eleven pounds in two weeks.

Colitis may occur as a result of stricture. I recently referred a patient to Dr. Ernest Gaither, because of much pain in the sigmoid region, through the left hip, and in the upper flank, together with frequent stools in which she passed mucous casts. After a careful study of her case Dr. Gaither asked me if it could be possible that she was suffering with ureter stricture. That this diagnosis had not occurred to me in going over her symptoms was the more remarkable because she was Case 2, reported in my paper above referred to on "Chronic Urethritis and Chronic Ureteritis Caused by Tonsillitis." Urethritis symptoms of two years' duration had resisted treatment for several months until her infected tonsils were removed. She had remained well of the urethral symptoms for more than six years, and then began to complain of the colitis symptoms which at Dr. Gaither's suggeston I found were due to a dense stricture of the left ureter. Manipulation of the stricture area and injection of the kidney pelvis imitated all of her discomfort on the left side, and her colitis symptoms ceased after the second ureter dilatation.

Mental Symptoms. One of the remarkable results of this study has been to find that a patient may have one normally functioning kidney, and only a slight degree of stasis on the opposite side which apparently results in mental disturbances, headaches, nausea, fever, and a general picture usually associated with the uremic state.

Fig. 5 is from a patient who had ureter kink due to a fan-shaped band of adhesions suspending her sigmoid to the posterior peritoneum just above the pelvic brim region. While in the recumbent position, taking a "rest cure," many of which she had been subjected to during the twenty years of her symptoms, she would take on weight and be comparatively well. As soon as she returned home and attempted to lead a normal busy life the weight of the sigmoid displaced her ureter and again caused her "spells." These attacks consisted of a fever ranging from 99° to 100°, malaise, headache, and a slight pain in the left lumbar

region. The patient could "taste her fever" and tell by this peculiar reaction just where the thermometer would register within one-tenth of a degree. It is impossible to say what share toxemia played in her mental condition and how much of it was due to the disappointment and worry over her inability to get well. During her first six weeks under Dr. Barker's care it was considered essential to keep her in a barred room and have the constant care of a nurse.

The urine was quite normal and *x*-rays of the abdomen were negative. Dr. Barker asked me to investigate the left kidney because of the slight lumbar pain accompanying her attacks. After freeing the adhesions between the sigmoid and the left ureter peritoneum the patient made a prompt and full recovery and wrote me six months after the operation that she had gained twenty-two pounds.

A case showing marked mental symptoms due to obstruction in one ureter was that of a physician who suffered for about a year with a morbid mental state entirely foreign to his usual happy buoyant disposition. Delusions and hallucinations worried him daily and as in the case above reported, suicide became an urgent impulse. He was entirely relieved after Dr. George Walker dilated a ureter stricture.

Morbid Anatomy. We have had opportunity to study the stricture macroscopically in 8 operation cases. The inflammatory area varies from a slight annular thickening in the ureter wall to a condition of diffuse cartilage-like thickening which may occupy several centimeters of the ureter and form a mass a centimeter in diameter. Multiple annular strictures are not uncommon.

The infiltration may be confined to the ureter wall or there may be much periureteritis. Often at operation one cannot tell by palpation whether he is dealing simply with a stricture or with a stricture containing a stone.

I have had opportunity to study the stricture microscopically in only 3 cases, in Cases 6 and 26, who had resection of the ureter and implantation into the bladder, and in

Case 50, who had nephrectomy. The microscopic picture is one of chronic inflammation of all coats of the ureter wall, the epithelium is changed from the transitional stratified type to a more squamous type, and in one of the specimens there was an ulcer with loss of the epithelium.

Location of the Stricture. The stricture is located in the broad ligament region or within 6 cm. of the bladder in by far the greatest number of cases. The next most frequent location is at the bifurcation of the internal iliac vessels or about 8 to 10 cm. above the bladder. This is from 3 to 5 cm. below the pelvic brim. At both of these regions we have a group of lymphatic glands and at operation these are sometimes found enlarged. Contrast these locations with the generally accepted view that ureter stricture is congenital and occurs at the points of congenital narrowing, namely where the kidney pelvis enters the ureter, at the pelvic brim, and in the bladder wall area.

In the preliminary report on my first 50 cases 12 were reported as bilateral. Since then 3 of the 38 cases reported as monolateral have returned with stricture on the opposite side. Of the 35 monolateral cases 20 were on the right and 15 on the left. Of these 65 ureters with stricture the lesion has been located within 6 cm. of the bladder in 56, at the region of the bifurcation of the internal iliacs in 8 cases, and next to the kidney in 1 case.

Effects of the Stricture on the Upper Urinary Tract. Of the utmost interest is the relationship between ureter stricture and other lesions of the urinary tract. This study has done much to explain the etiology of many urinary tract lesions concerning which we have had erroneous ideas in the past.

The profession has become accustomed to view slight dilatation of the pelvis and ureter as secondary to an infection of the urine. It is even held for the early cases with only slight dilatation and sterile urine that such cases came by the dilatation through a previous infection.

This view so generally held is well expressed by Braasch:[14] "Any considerable degree of infection involving the renal pelvis and ureter will be followed by dilatation. This dilatation is not caused by mechanical obstruction, but is the result of change in the tissues and consequent retraction in the walls of the pelvis and ureter. The dilatation may vary from a scarcely recognizable irregularity of the calyces or ureter to complete destruction of the pelvis. Evidence of an inflammatory process which has once caused dilatation will rarely be entirely obliterated. Such inflammatory changes in the pelvic or ureteral outline may be the only evidence of previous infection. The character and degree of an inflammatory process can more often be determined by means of the pyeloureterogram than by any other method."

A priori, one would expect the inflammation and infiltration to result in shrinkage rather than in dilatation of the tract.

While I consider it possible for the urine to become infected at the same time that the infection, which is to result in the future stricture, is laid in the ureter wall, I think these studies prove conclusively that the usual sequence is focal infection settling in the ureter wall, stricture formation, stasis and secondary infection of the urine.

Although we believe we have demonstrated that most cases of dilatation of the pelvis of the kidney are due to mechanical obstruction in the form of ureter stricture a surprising development has been the fact that many cases of ureter stricture causing typical symptoms are not associated with a dilated pelvis, and when the pelvis is not dilated it is often contracted. These cases with contracted pelves are usually the most sensitive to manipulation and the contracted pelvis is probably explained by assuming that the extremely sensitive stricture area keeps up a constant pain reflex causing a tonic spasm of the musculature of the tract above.

Pyeloureterograms of these cases show that in some the

Fig. 1.—Illustrating stricture of right ureter due to gunshot injury. Symptoms began eight years after injury. Note stricture just below the pelvic brim, and the slight dilatation of the ureter after three months of rather severe kidney symptoms. Bladder urine normal, no infection.

FIG. 2.—Mrs. R., aged forty-three years, two attacks, December 20, 1915, and February 25, 1916, of symptoms typical of ureter stone, each attack requiring repeated hypodermics of morphin. Great pain beginning in left groin and settling in left kidney region, then extending from kidney to bladder, and causing great frequency of voiding; great distention of bowels, nausea, and vomiting; rectal tenesmus and ineffective attempts at stool. Urine port-wine color, with blood, many leukocytes, negative to culture. Stricture 4 cm. from bladder; kidney holds 16 c.c.

Fig. 3.—Arthritis attacks for past ten years. Treated in New York three years ago for antrum trouble. Pyelitis attacks for past four years. Colon bacillus infection of left kidney which resists lavage treatment with silver nitrate. On several of the first six treatments the catheter was slightly obstructed, but stricture was first suspected because of resistance of the infection to lavage treatment. A large wax bulb demonstrated stricture 4 cm. above ureter orifice. Kidney pelvis holds less than normal content, but pyelo-ureterogram shows slightly dilated ureter.

FIG. 4.—Represents the effect of ureter stricture on the pelves of a horseshoe kidney. Mrs. P., aged fifty-five years, consulted Dr. L. F. Barker in January, 1916, because of attacks since March, 1915, of great abdominal distention, pressure feeling in the back of the neck, and hysterical laughing and crying. With these symptoms she had much diarrhea and had lost twenty pounds in weight in the year. Careful examinations and analyses resulted in finding a condition of achylia gastrica, and a mass in the lower abdomen which Dr. Barker considered a horseshoe kidney. On my first attempt the right ureter could not be catheterized and the left was catheterized with great difficulty because of strictures near the bladder. After the trauma of this partial failure the patient had a typical attack that night of excessive distention and hysterical noisy wakefulness. Later attempts were successful in dilating the ureters, and the patient was greatly improved. The right kidney held 90 c.c. and the left 340 c.c. The urine was negative to culture, the right side being free of abnormal elements and the left containing a few leukocytes. Letter from Dr. C. H. Fair, Greenville, S. C., April, 1917: "Patient seems perfectly well."

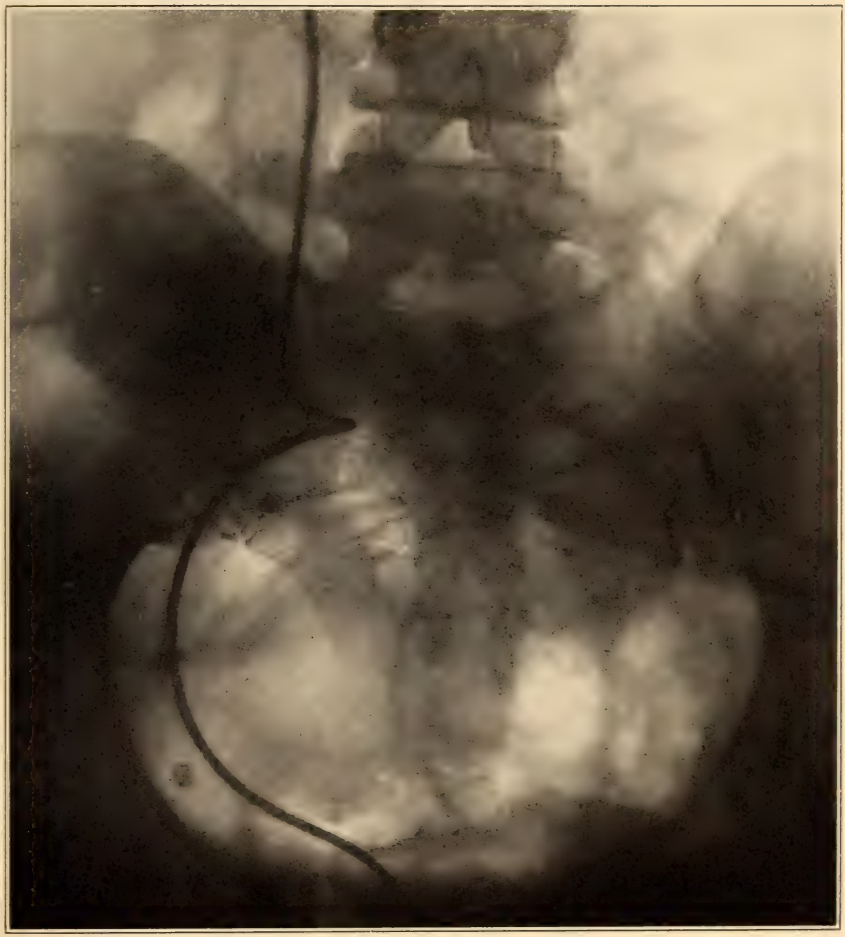

FIG. 5.—Illustrates a case with almost impassable obstruction from below but in which the characteristic "hang" and scar tissue grating on withdrawal of the wax bulb were absent. The angulation was due to peritoneal bands. Figure should have been printed to show ureter on left side.

FIG. 6.—Mrs. L., aged forty-one years, complained of pain in the lower right pelvis, through the hip and in the thigh since sixteen years of age. Considered to be due to a fall across a fence. Also considered as female trouble because the pain came only at the menstrual periods for the first few years. For the past twenty years the pain has come on at any time but is worse at the menstrual period. In the past year more pain in right kidney region. Operated, J. H. H., March, 1914: appendectomy and supravaginal hysterectomy for pelvic inflammatory disease and fibroids. Before leaving, the patient told Dr. Watkins, the resident gynecologist, that he had failed to cut out her old pain low in the right side. My associate, Dr. Wynne, made the first examination for ureter stricture, and the patient said she was sure he had discovered her trouble because she could scarcely use the right hip the day following his treatment. The kidney pelvis held but 5 c.c.; her symptoms were greatly improved after five treatments. She will probably need tonsillectomy. Figure should have been printed to show ureter on right side.

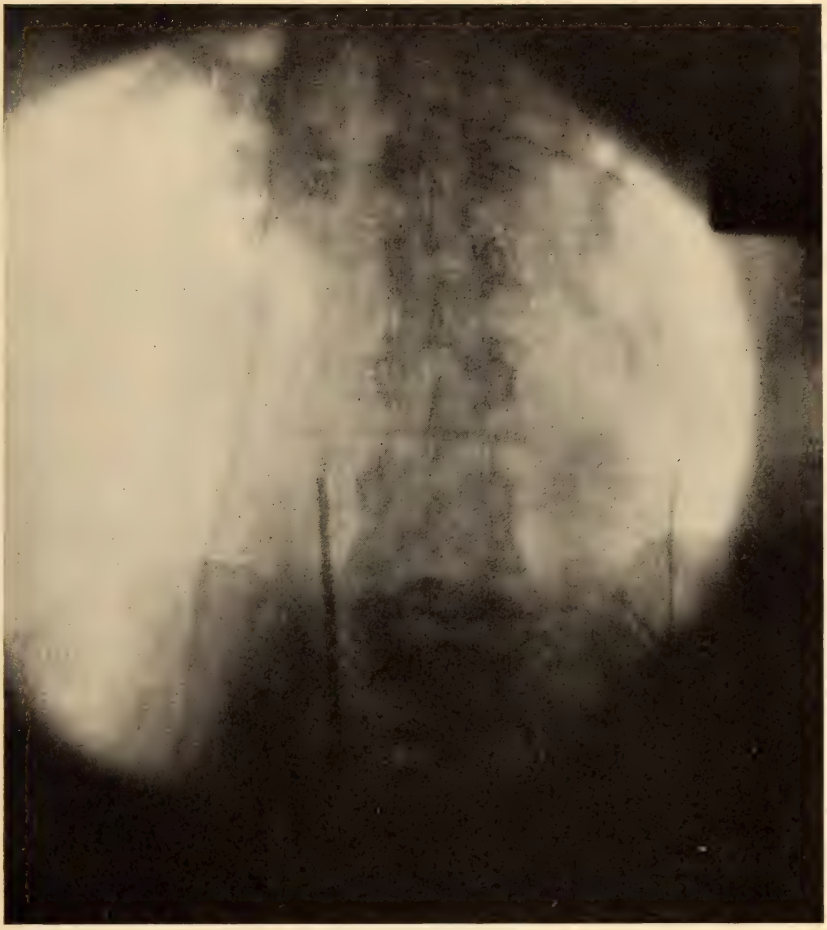

FIG. 7.—Mrs. H., aged thirty-seven years, referred by Dr. L. C. Woodard, Westminster, Md. Pain in the upper right abdomen for six or seven years. For the past few months a gnawing feeling in upper flank, at times in front, at times in back, at times in axillary line. Interfered with getting to sleep. Thinks she feels best when up and moving about. Appendix removed four years ago. Recently, *x*-rays taken in Philadelphia for gall-stones; negative. Gastric analysis = hypo-acidity. Wassermann negative. History of tonsillitis ten years ago. X-rays of two crowned teeth show abscesses. Urine examination always normal. Test for ureter stricture, wax bulb hangs at iliac gland region and broad ligament region. Pain much relieved after the first examination, and a gain of 5 pounds in four weeks. Only two dilatations necessary.

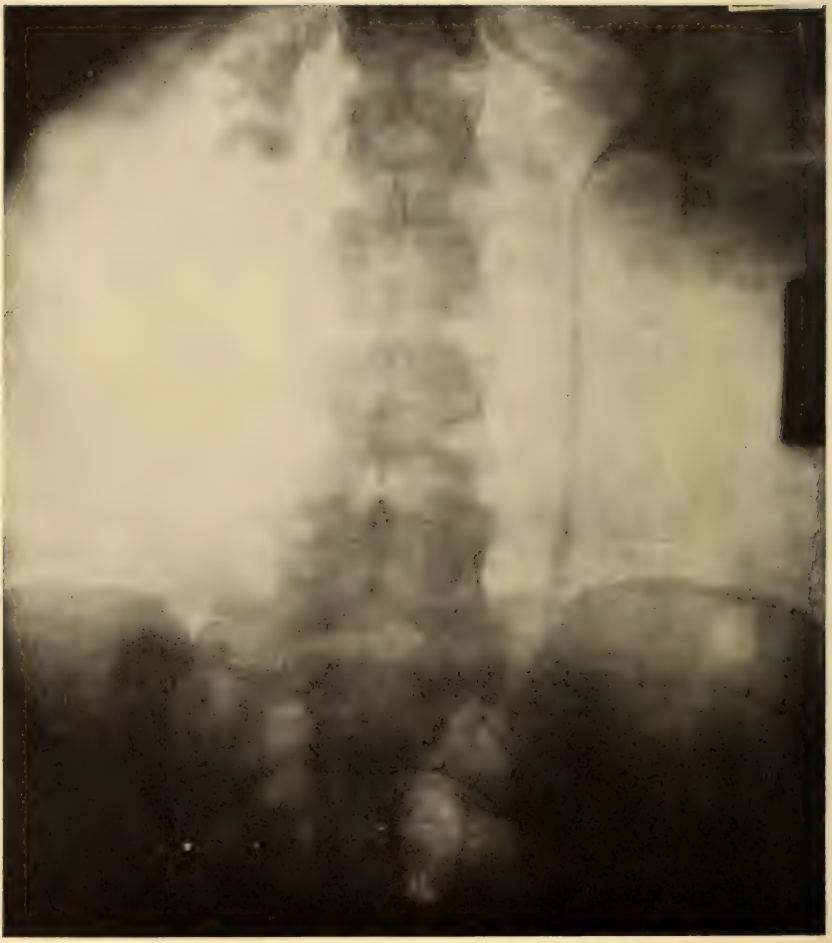

Fig. 8.—Illustrates a patient who had suffered with intermittent renal colic on the left side for fourteen years and on the right side for nine years. The strictures in the broad ligament region were so dense as to be almost impassible, yet the kidney pelves held less than normal and the ureters were but slightly dilated.

FIG. 9.—Same case as Fig. 8, showing slight dilatation of the left ureter.

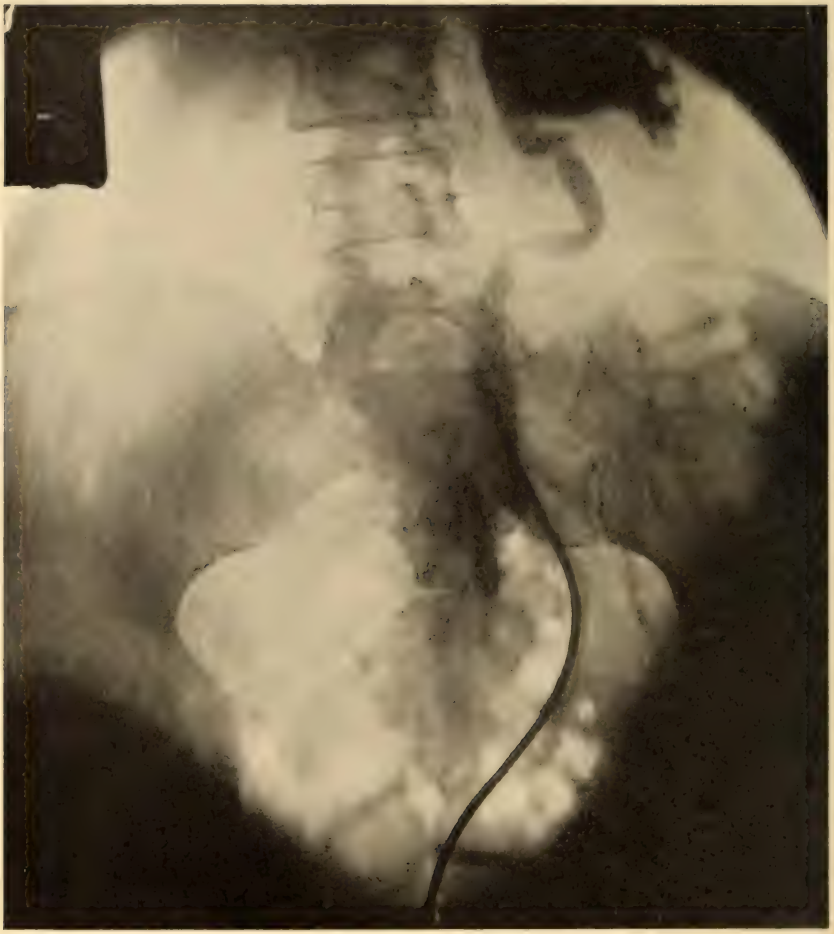

FIG. 10.—Right kidney. Illustrates slight dilatation of pelvic ureter above a stricture in the broad ligament region and a wider dilatation of the ureter, hydronephrosis, prolapse, and kinks in the upper ureter, due to a stricture in the iliac gland region.

FIG. 11.—Case XVIII, suffering with left kidney colic several years. The *x*-ray revealed stone in pelvis of the kidney. Investigation with the wax-tipped catheter accidentally led to the discovery of ureter stricture 7 cm. from the bladder, the kidney pelvis holding 8 c.c. Complete relief of symptoms after dilatation of the stricture and the patient refused operation in spite of being shown the *x*-ray of her kidney stone. This case probably explains the occasional case seen by the surgeon in which pyelotomy for stone is followed by urine drainage for a disappointing length of time, and after healing the patient continues to have symptoms similar to those before complained of.

FIG. 12.—Case L. Aged thirty-two years, the only case in the list of fifty with stricture near the kidney. Catheter diverted laterally just above the pelvic brim and stopped at this same point in radiograms taken on three different days. Could not inject sufficient thorium into the kidney to get a definite shadow of pelvis. Nephrectomy; stricture immediately below the enlarged pelvis would not take the fine silver probe. The patient had suffered attacks since early childhood, the pain beginning in the appendix region; and as it grew more severe it traveled diagonally across the abdomen and settled in the left kidney region. Operation three years previously, removing a diseased appendix and chronic pelvic inflammatory trouble, but without influencing her chief symptoms. Figure should have been printed to show ureter on the right side.

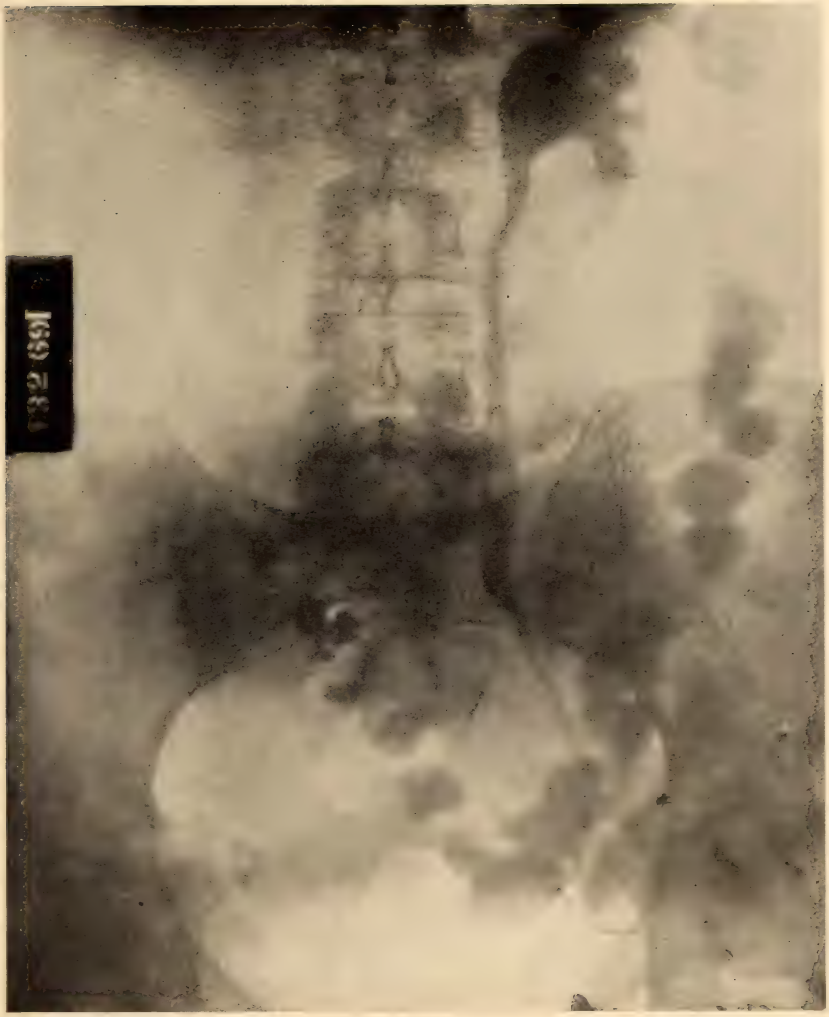

Fig. 13.—Case XXII. Patient, aged forty-seven years, who had passed a navy bean-sized ureter stone five years previously. Complaint chiefly of pain in the left flank and pressure in the rectum. Failure of catheter to go beyond the pelvic brim region at first examination. Successful catheterization at all later attempts and dilatation with the wax bulb. Rapid shrinkage of pelvis of the kidney from 28 c.c. to 10 c.c. and relief of symptoms. Observation five months later; pelvis of the kidney held 10 c.c.

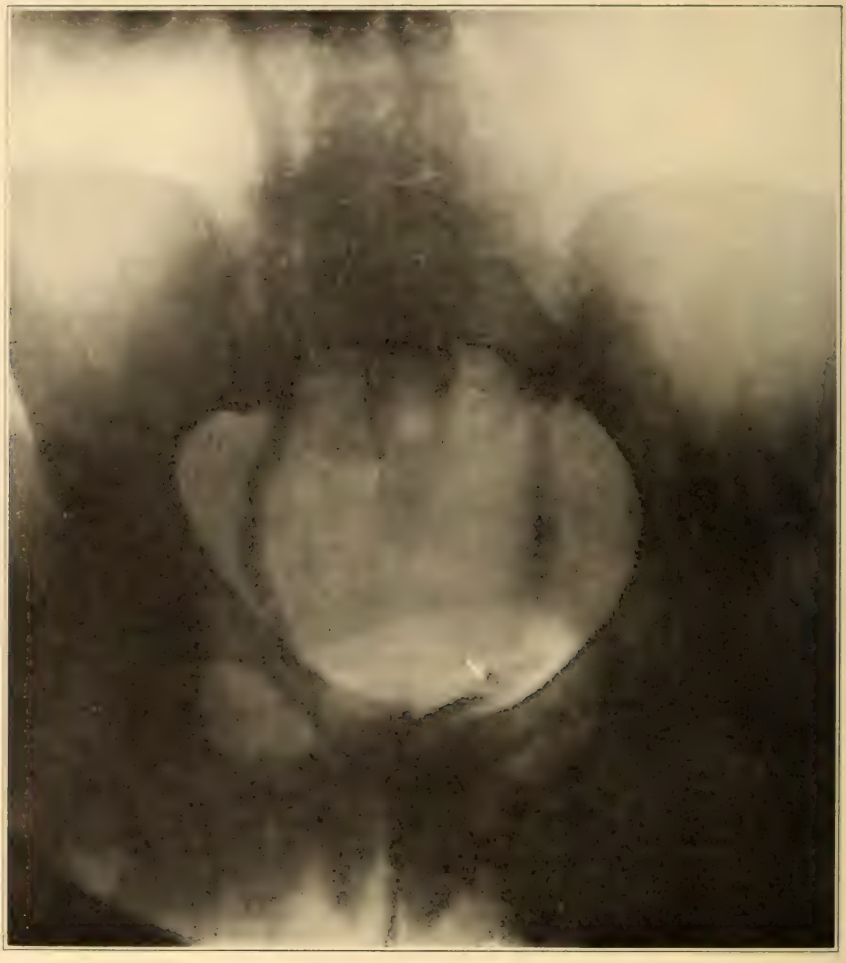

FIG. 14.—Mrs. C., aged forty-eight years. Severe renal attacks on right side for eighteen months requiring much morphin. No symptoms on left side. Urine catheterized from bladder, leukocytes, erythrocytes, bacteria, trace albumin. Stricture of right ureter 2 or 3 cm. from bladder. On getting thorium *x*-ray, found unsuspected obstruction and dilatation of left side. After withdrawing catheter from left side and finding scratch marks, the small stone was discovered in lower end of left ureter at a point symmetrical with the stricture of the right side. Examination with wax-tipped bougie twenty-four days later showed that the stone had been passed.

Fig. 15.—Case XL, aged twenty-six years, tonsillitis since childhood. Intermittent renal colics on left side for one year, on right side for three months. Stone 3 cm. from bladder on left side in dense stricture area. Dense stricture 3 cm. from bladder in right ureter. Bilateral hydronephrosis. Urine not infected.

FIG. 16.—*a*, gall-stone; *b*, appendix stone from author's Case XXXVII, whose symptoms were due to ureter stricture; *c*, ureter stone from author's Case XX, showing deep channel for free passage of urine, the patient's hydronephrosis symptoms probably due to a dense ureter stricture located 3 cm. below the stone and about 3 cm. above the bladder; *d*, ureter stone from author's Case IX, removed from stricture area five years after treatment of ureter stricture.

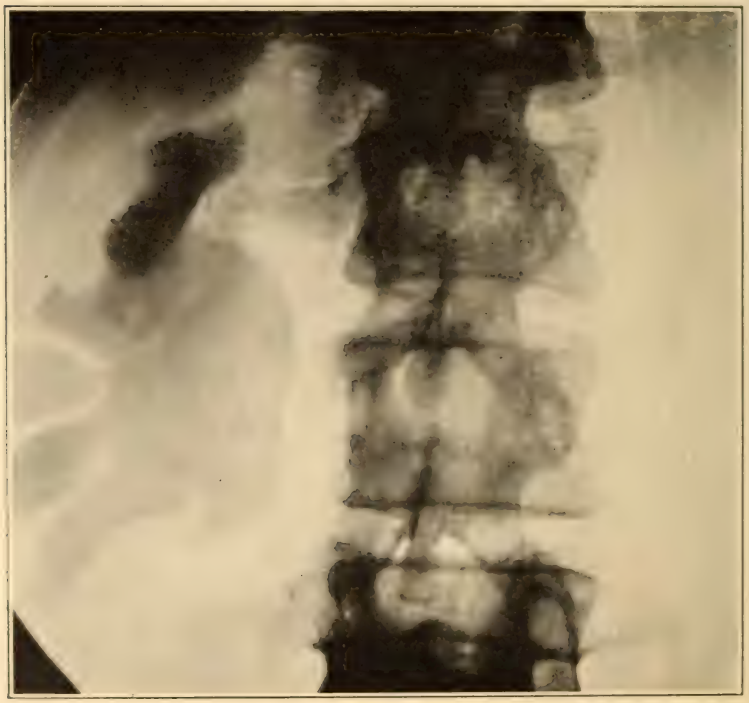

FIG. 17.—Case XLIX. Tonsillitis since early childhood. Left hydronephrosis attacks since two years of age. Destroyed left kidney removed in 1901, at age of twenty-two years. Hysterectomy for fibroids January, 1915. Convalescence marked by pyelitis attacks in right kidney. Intermittent lavage for ten months often followed by severe pyelitis attacks. Pyelogram, Charlottesville, Va.: Right kidney pelvis holds 40 c.c.; ureter stricture well dilated October, 1915; colon bacillus infection and all symptoms gone December, 1915.

Fig. 18.—Patient admitted to the Johns Hopkins Hospital in July, 1912, suffering with repeated chills and a hectic fever ranging as high as 104° F. Right kidney capacity 100 c.c., with a turbid, purulent urine. Left kidney capacity 120 c.c., with thick turbid urine as of a pyonephrosis. Both ureters had infiltrated areas near the bladder, and cultures revealed colon bacillus from either side. After dilating the strictures and washing the kidneys with silver nitrate solution the patient promptly improved and left the hospital after three weeks feeling well, and with urine from each kidney showing only microscopic pus and bacteria. Comparatively good health after this thorium *x*-ray for four years until death from uremia.

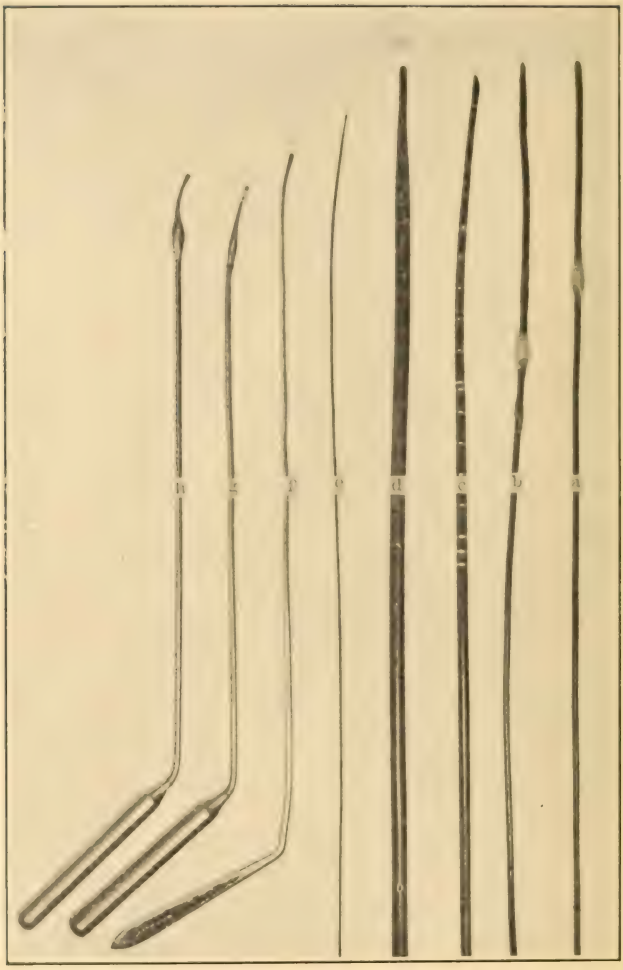

FIG. 19.—Set of ureteral catheters, etc., used by author. *a*, blunt round-tip renal catheter with wax bulb; *b*, olive-tip renal catheter with large wax bulb, protected on either side with smaller bulb; *c*, Garceau graduated whistle-tip catheter; *d*, flexible bougie (7 mm. diam.). Sizes vary from 3 to 10 mm., the smaller sizes being useful for dilating through the cystoscope from below, and the larger sizes for retrograde dilatation from above; *e*, whalebone filiform (varying sizes are used through the cystoscope); *f*, metal searcher with olive tip; *g*, metal bulb dilator 3 mm. with curved olive tip; *h*, metal bulb dilator 5 mm. with curved olive tip.

Fig. 20

Fig. 21.—Miss H., aged forty years. Right nephrectomy for stone April, 1900. Consulted Dr. Kelly May, 1914, for a constant pain in the left kidney region. Investigation of kidney and failure to find cause of the pain. Consulted author in June, 1914, and again in March, 1915, and no cause found in the urinary tract for the pain. Operation, J. H. H., March, 1915: hysterectomy for fibroids and left oöphorectomy for "tender left ovary." Returned in October, 1915, with the same pain in the left kidney region, and examination showed definite stricture and a hydronephrosis of 18 c.c. This hydronephrosis increased to 32 c.c., while the patient was having repeated dilatations of the stricture. After removal of several abscessed teeth the dilatations gave permanent relief, with a shrinkage of the pelvis of the kidney to 10 c.c. Figure should have been printed to show the shadow on the left side.

ureter is contracted as well as the kidney pelvis (Figs. 6 and 7) and in others the pelvis is contracted, while the ureter is slightly dilated (Figs. 3, 8, 9). In some of these cases the pyelogram shows a larger pelvis than one gets by measurements. Fig. 7 shows an apparently normal-sized pelvis, but the capacity tests showed a tolerance of about 4 c.c.

Several cases with normal-sized or contracted pelves when first seen have improved in their general symptoms while having repeated dilatations, but the pelvis of the kidney has in the same time developed a slight hydronephrosis. The probable explanation of this phenomenon, is that a tender ulcer in the stricture area has healed under treatment, thus releasing the reflex spasm, but the stricture is dense enough to keep up partial obstruction in spite of the dilatations.

In the first group of 50 cases there was no urine report on 6 cases. I have notes on culture taking in 27 of the remaining 44 cases. In 9 of these the urine was sterile. Of the 17 cases in which there was no report on culture taking the urine from the kidney was free from leukocytes in 7, and was presumably sterile, which would make 16 out of 44, or over one-third of the reported cases sterile. Ten of these 17 cases without report on culture taking had pus in the specimen catheterized from the bladder, and in 7 of these the kidney specimen is also reported as yielding pus, and possibly all 10 cases were infected.

In the 16 non-infected cases the average age was thirty-eight years, the average duration of symptoms two and a half years, and the average size of the kidney pelvis in 10 of the cases was 19 c.c., 3 of these holding 8, 11, and 12 c.c. respectfully, and the others holding from 15 to 30 c.c. In one exceptional case, with symptoms of four years' duration, the pelvis had reached a capacity of 360 c.c. without becoming infected. In 5 cases there was no note on the pelvis capacity.

Of the 18 infected cases the average age was thirty-five years, the average duration of symptoms was four years,

and the average size of the pelvis of the kidney in 15 cases in which a record was made was 98 c.c. In 4 of these 15 cases the pelvis was of normal capacity, 7 to 8 c.c., showing for the 11 dilated cases an average capacity of 130 c.c. In the cases with both pelves dilated the capacity is figured on the larger pelvis only.

In the 18 infected cases of the first group the colon bacillus was grown in 13, in 5 of these from both kidneys. In 4 cases staphylococcus only was grown, in 1 case a pure typhoid culture was obtained soon after recovery from typhoid fever. In 1 of the above colon bacillus cases colon was grown from one kidney and staphylococcus from the other, making 5 cases in which staphylococcus was grown.

Influence of Ureter Stricture on Stone Formation. One of the most interesting side lights on ureter disease furnished by this study has been the revelation of the probable cause of most ureter stones. In operating for a ureter stone and finding it encased in dense infiltration tissue we have heretofore considered the inflammatory area as due to the irritation of the stone. We now have abundant evidence to indicate that the stone results from urinary salts being deposited on the ulcerated surface of the stricture area.

Every surgeon sees an occasional case in which a minute stone or a nest of minute stones is found encased in a dense stricture area. It is quite evident that such small stones were not formed in the kidney to be stopped in a normal ureter, nor were they formed in a normal ureter. Such small stones would easily be passed entirely through a normal ureter.

There can be no doubt that an occasional stone formed in the kidney is blocked in a normal ureter. On the other hand I believe that some stones found in the kidney were originally formed on the site of a ureter stricture, and after sufficient dilatation of the tract above these stones have floated up into the kidney, where they have increased in size.

Figs. 11 and 12 illustrate two such possible cases. Fig. 13 illustrates another possible sequence, viz., that a stone forming in a stricture area may develop sufficient pressure above to force it out of the stricture and into the bladder. In this case the stone was spontaneously passed from the bladder. In Case 23, who had suffered with bladder discomfort and incontinence for nine months, a stone 15 mm. in diameter was removed from the bladder. The *x*-ray revealed another small shadow in the left broad ligament region, and investigation with the wax-tipped and wax-bulbed catheter demonstrated this to be a venous phlebolith, but the patient had two strictures in the broad ligament region and a left colon bacillus pyelitis with kidney content of 21 c.c.

Case 71, aged thirty-seven years, had suffered for eight years with left renal colic, the attacks becoming so severe recently that they required several hypodermics of morphia for their control. The urine was smoky with blood and continued pus and a colon bacillus infection. On passing a catheter prepared with small wax rings at intervals of 5 cm. to locate the possible ureter stone, and with one large wax bulb to dilate the ureter, the catheter returned with scratch marks on all the rings within 20 cm. of the tip. The eye of the catheter contained a particle of stone and the large wax bulb had imbedded in its surface about a dozen particles of stone. The patient was completely relieved of her severe colic attacks and subsequently had several dilatations of the stricture area until all her symptoms were relieved. She had the contracted type of pelvis holding but 4 c.c. Scratch marks were never obtained after the first treatment which seemed to have entirely cleared out the incipient stone formation.

One of the strongest arguments for the relationship between stone formation and stricture is the finding of bilateral symmetrical stricture and a stone in one of these stricture areas, as has occurred in 3 of my cases, 2 of which are illustrated

in Figs. 14 and 15. A large ureter stone (Fig. 16, *d*) was removed from the right broad ligament area in Case 9 five years after I had been dilating strictures in the right broad ligament area and iliac gland region and in the left broad ligament region. The obstruction by the right broad ligament stricture and this stone had made a large dilatation of the right ureter in which at operation the stricture at the iliac gland region was seen to form a dense annular narrowing.

O. S. Fowler, of Denver,[15] has called attention to the possible importance of stasis in the etiology of stone formation. He attributes the stasis to a kink in the ureter, due to prolapse of the kidney, as demonstrated by the method he has done so much to develop of taking pyeloureterograms in the erect posture. Many of his roentgenograms, however, reveal ureters which are dilated below the point of kinking as well as above and I would interpret them as being cases of unrecognized ureter stricture low in the channel causing a dilatation of the ureter and kidney pelvis, and a prolapse of the heavy hydronephrotic kidney, causing apparent kinks in the upper ureter. I have several ureter stricture cases showing this kidney prolapse and apparent ureter kinking but they all show the ureter dilatation down to the stricture area as illustrated strikingly in Fig. 10.

Influence of Ureter Stricture on the Pyelitis of Pregnancy and Puerperium. Of my last 7 cases of pyelitis developing during pregnancy or soon after delivery, 3 being bilateral, I have been able to demonstrate stricture of the ureter in all but 1 case. This is probably a much higher percentage associated with stricture than we would find in a longer list of cases. In most of these cases the stricture is probably present before the pregnancy, and the added congestion of the tissues during pregnancy sets up a slight hydronephrosis which becomes infected during the pregnancy or immediately after.

Some of the cases of pyelitis of pregnancy due to stricture

clear up spontaneously after labor when the congestion and edema incident to pregnancy disappear. Others continue as a chronic pyelitis until treated. Undoubtedly most of those cases of pyelitis of pregnancy which clear up spontaneously or after a few irrigations with silver solution do so because stricture is not present, or because the slight dilatation of the stricture incident to passing an ordinary renal catheter is beneficial.

That a case may clear up spontaneously in spite of ureter stricture is illustrated by a patient referred by Dr. Barker (Figs. 8 and 9), because of attacks of renal colic together with chills and high temperature. Fourteen years before Dr. Kelly was compelled to perform abortion for this patient because of bilateral colon bacillus pyelitis. She had no special treatment for the pyelitis, returned home with infected urine, and had had recurring attacks of pyelitis symptoms on the left side during the intervening fourteen years and on the right side for nine years. Examination revealed extremely dense bilateral strictures with kidney pelves smaller than normal and ureters of very slight dilatation. The urine contained many hyaline and granular casts and a few pus cells found to be coming from the left kidney. There was no infection. It could very well be argued that this patient had no stricture at the time of her pregnancy and that the pyelitis resulted in later stricture formation. My experience with such cases leads me to take the view above expressed, particularly as she had suffered all her life with tonsillitis and made no permanent progress with her ureter stricture dilatations until after the badly diseased tonsils were removed.

Diagnosis. The diagnosis of ureter stricture depends upon the history, urine examination, palpation of the abdomen, with special reference to the kidney and ureter regions, palpation of the ureters through the vagina or rectum, cystoscopy, catheterization of the ureters by specially prepared catheters, and roentgenography.

The features obtainable by history taking have been discussed above under the section on symptoms. Experience has taught that we should suspect stricture in any case complaining of obscure abdominal symptoms particularly if they are in the lower abdomen and accompanied by referred pain in the hips and thighs. In addition to this history we usually find that the patient has a history or shows evidence of tonsillitis, sinusitis, or bad teeth. Since having colleagues refer such obscure cases for diagnosis I have learned to place considerable importance on a history of previous abdominal or pelvic operations in which the patient failed to obtain relief.

Urine Examination and Diagnosis. In the section on symptoms we stated that the urine may be quite negative. This has undoubtedly been a source of frequent error in the past. Given a patient with symptoms that suggest trouble in the urinary tract we have been willing to exclude the urinary tract on finding normal urine. If the patient's symptoms strongly suggested stone in the ureter we have had *x*-rays taken. We have the word of the *x*-ray experts that they miss anywhere from 15 to 30 per cent. of ureter stones, which fact alone should demand examination with the wax-tipped catheter in all cases of suspected stone. With the facts that the unassisted *x*-ray will miss all ureter stricture cases and that the urine may be normal, we have thrust upon us a duty heretofore neglected, namely, to have all questionable cases investigated with specially prepared catheters and perhaps with the thorium *x*-ray.

Palpation. There is often tenderness in the kidney region, and the kidney may be somewhat enlarged and very tender during one of the acute pain attacks. The usual phenomena of an intermittent hydronephrosis may be palpated if this condition be present.

Palpation of the ureter over the pelvic brim may elicit tenderness and a desire to void. This tenderness over the pelvic brim region has led to many useless appendix opera-

tions. With both conditions in mind when palpating, one can usually differentiate between them as the patient will indicate that her usual area of pain is deep in the pelvis back of the symphysis, although one may reach more tenderness at the pelvic brim region on abdominal palpation and mistake it for an indication of appendicitis.

Vaginal palpation will show the greatest tenderness to be in the broad ligament region in a vast majority of cases and one may actually palpate the node of thickening which in some cases cannot be differentiated from stone in the ureter.

One may easily mistake the ureter tenderness for a painful ovary.

Case 56, then aged forty years, consulted me first five years ago, complaining of some of the disturbances of the menopause and a nagging pain low in the left pelvis. She had been advised to have left oöphorectomy. I found that the left ovary, while apparently extremely tender, was of less than normal size, feeling like a senile fibrous ovary. I advised against operation. She recently consulted me again, having suffered intermittently with the same pain and having it recently much exaggerated after a long automobile ride. She had also developed considerable pain in the left kidney region and feared that she might be developing cancer.

I suspected ureter stricture and found on bimanual examination just as found five years previously that the left ovary was small and hard and apparently extremely sensitive. By carrying the ovary medianward and isolating it from the broad ligament region it was not at all tender. Then by dropping the ovary and palpating the ureter by itself, it was found to be the seat of pain and tenderness. Two dilatations of her left ureter stricture have resulted in a most satisfactory clearing up of symptoms of six years' duration. There was a draining abscess at the root of one tooth and she was referred to her dentist to have *x*-rays and the necessary dental work attended to.

Catheter Test. The crucial test in diagnosing ureter stricture is made with the wax-bulbed catheter. This, with other instruments used in getting past and treating stricture, will be described under the section on Treatment. I do not consider obstruction to an entering catheter as diagnostic of ureter stricture. Repeated obstruction at the same point is certainly suggestive, but for a positive diagnosis I depend entirely upon the obstruction or "hang" of the wax-bulb on withdrawal. Obstruction of the tip at a certain point in the ureter and then obstruction of the entering bulb at the same point, and the going by of the bulb with a jump and sense of scar tissue grating are points upon which the experienced cystoscopist can rely with a fair degree of safety; but there are many conditions which may obstruct a catheter on entering, and it is better to depend upon the "hang" of the bulb, its jump, and scar tissue grating sensation as it comes through the stricture area on withdrawal. In the case illustrated by Fig. 5, I did not get by the obstruction until the third attempt at intervals of ten days, and then got by only by changing the position of the patient from the knee-chest to the right lateral position while using considerable force on the catheter with the stylet in. I considered this a stricture case because of the great difficulty in getting by, but after getting the thorium *x*-ray and before development of the plates, I said the case was not one of stricture, because on withdrawal of the bulb there was only the faintest obstruction at the pelvic brim region, just as one can detect as the bulb comes through the bladder wall and again as it comes through the sphincter urethræ. It has been a source of great satisfaction to the author and his associates in this work to find at operation on a number of cases how accurately the wax bulb has located the position and the number of strictures, and how in other cases like the one just cited with ureter obstruction, but no "hang" of the bulb on withdrawal the operation has explained the cause of the obstruction.

It is important to remember that one may pass the ordinary renal catheter of large size without detecting a stricture. The presence of a hydronephrosis should make one suspect stricture and test for it with the wax bulb. In case of a pyelitis in which catheterization is followed by temperature reaction or a chill one should suspect stricture and should wait at least a week before making the next test with the wax bulb. Some cases without infection show a marked reaction after catheterization, having an elevation of temperature and an unusual amount of pain and sometimes nausea and vomiting. Any of these unusual reactions after the passage of the ordinary catheter should prompt one to test for stricture. In some of my pyelitis cases I have not suspected stricture until the patient failed to show improvement after repeated lavage. Fig. 3 shows a case in which I had washed with silver nitrate solution six times before suspecting stricture because of the lack of improvement in the pyelitis.

In Case 49 (Fig. 17) I diagnosed stricture from the correspondence concerning the case, this indicating that the patient had but one kidney, and this the seat of an infected hydronephrosis. She was getting lavage treatment, but frequently had severe temperature reaction, chill, and prostration after the treatment. The correspondence also related that she had lost one kidney by operation at the age of twenty-two years, after suffering with intermittent hydronephrosis attacks since babyhood, and that she had always had tonsillitis.

Roentgenography. The taking of pyeloureterograms is not necessary in making a diagnosis except in the few cases in which we cannot go by an obstruction in the ureter. Under such conditions if we can pass an *x*-ray catheter with whistle tip to the point of obstruction, we can often get the contrast solution to go beyond the obstruction and intensify a stone, if it be present, or outline the character of the obstruction and the condition of the tract above.

In Case 50 (Fig. 12) we failed on several occasions to get enough thorium past the stricture to get a shadow in the kidney pelvis. Urine with pus and blood was coming from the kidney.

While the *x*-ray is not necessary in making a diagnosis in most cases of ureter stricture, and while I refused to use it on my early cases when we were dependent on collargol with its dangers, I now use it in most cases for the satisfaction of its confirmatory value, and because I find that the thorium may be used with impunity if used with judgment.

Fig. 18 illustrates Case 16, who died in uremia without passing urine for twelve days after this thorium picture was taken. I attribute the death not to the use of thorium but to the treatment of both sides at the same time, resulting in the swelling shut of both ureters. In the lavage of her kidneys, one at a time, at intervals over the previous four years, she occasionally had a severe reaction in fever, chills, nausea, vomiting, headache, and prostration, and this should have been a warning never to stir up both sides at one time.

The ureterogram is of great value in deciding whether a small shadow on the unaided *x*-ray plate is within the ureter or whether we are dealing with a phlebolith. This point can usually be settled in women by using the wax-tipped and wax-ringed catheter. In using the radiogram method the opaque catheter or the styletted catheter should be photographed in the ureter. Many stones in the ureter are in the broad ligament region, as are many phleboliths, and for this reason it is safer to use the bifocal method, as a phlebolith in the uterine vein may be superimposed on the renal catheter, and with a flat plate we cannot make a certain interpretation.

Of even greater value is the use of these methods to differentiate ureter stricture from supposed stone in the ureter when the unaided *x*-ray has shown a shadow in the ureter region. Many surgeons have had the uncomfortable

experience of operating on at least 1 of these cases. The patient complains of symptoms suggesting stone in the ureter, the urine examination confirms this view, and the *x*-ray shows a shadow in the ureter region.

Diagnosis from Tuberculosis. Great care must be exercised not to mistake tuberculous disease of the ureter for ordinary stricture. In 1901 I performed resection of the ureter and implantation into the bladder on a case who had much pus in the urine, one negative examination for tubercle bacilli, and an impassable thickening in the lower end of the right ureter. The true diagnosis was revealed a few months later when I was called to operate on the patient for intestinal obstruction, which was found to be due to tuberculosis. The tuberculous kidney was removed later and the patient made a good recovery.

In October, 1915, Dr. Charles Austrian referred a young unmarried woman twenty-two years of age, who had been having much pain in the left pelvis and left kidney region, and bladder symptoms for about two years. She had had tonsillitis since childhood. She had had two operations, one dilatation and curettage, and one operation for suspension of the uterus and appendectomy. After one successful dilatation of an obstruction low in the left ureter and demonstration of a pyelitis, I was unable on several occasions to again dilate. I was planning to expose the ureter extraperitoneally and do retrograde dilatation when on a final cystoscopy, I was impressed with the large amount of edema about the ureter orifice region and made a second search for tubercle bacilli, which resulted in demonstrating them in large numbers. Nephrectomy for tuberculosis resulted in a restoration to health.

Differential Diagnosis. It may be well to close this section on Diagnosis by giving a list of various diagnoses these patients have had while their symptoms were chiefly due to ureter stricture. Urinary tract: cystitis, pyelitis, pyelitis of pregnancy and puerperium, pyonephrosis, floating kidney, hydronephrosis, stone in ureter, chronic Bright's disease.

Genital tract: pelvic inflammatory disease, ovarian disease. Gastro-intestinal tract: various functional disorders of stomach and intestines, chronic peritonitis, intestinal adhesions, sigmoid adhesions, colitis, chronic pancreatitis, gallstones, appendicitis. Joint and nerve conditions: lumbosacral and iliosacral joint pains, neuralgia of sacral plexus, sciatica. Mental disorders.

TREATMENT. The chief end sought in treatment is the relief of symptoms, and in the infection cases a urine freed of infection, and in all cases suitable for dilatation such a thorough opening of the stricture area that there will be no return of symptoms.

There are very few cases in which we cannot at least ameliorate the symptoms, and fortunately we can relieve the symptoms entirely in a large proportion of cases. There are exceedingly few cases of pyelitis which fail to clear up completely of their infection. I believe that time will demonstrate that in many cases we will not get a permanent dilatation of the stricture and complete relief of symptoms until we have eradicated the original focus of infection.

The ideal treatment for stricture of the ureter is by dilatation from the vesical approach. Naturally those whose work is confined to women and those who use the Kelly speculum have a great advantage in treating this disease. Various forms of operative cystoscopes and ureter instruments have been devised by Bransford Lewis and others, which makes it quite possible to do considerable effective work from the vesical end in the male.

My work being confined to women, I shall speak only of the methods which I have used in treating stricture, these having been largely developed or suggested by Dr. Howard A. Kelly.

A glance at Fig. 19 will show the simple instruments which I use, entirely with the tubular speculum of Kelly. As a rule I use the olive-tip catheter of sizes 7, 8, and 9, carrying a wax bulb 8 to 10 cm. back of the wax-tipped end (*b*). Not infrequently the olive-tip catheter refuses to pass

when a round tip (*a*) or a whistle tip (*c*) will engage the lumen and go by the stricture. One may use the ordinary whistle-tip catheter with the wax bulb or the whistle-tip catheter with a gradually increasing diameter, which Garceau devised for the special purpose of making functional tests (*c*). This Garceau catheter in sizes 11 or 13 gives a fairly good dilatation without adding the wax bulb.

At times these catheters engage the lumen of the stricture area better with the wire stylet left in for stiffening, and at times a slight withdrawal of the stylet will result in success when the catheter has seemed permanently obstructed.

In case of failure to get by with any of these forms of flexible catheter it is sometimes possible to make the first entrance with the metal searcher (*f*). By slightly curving the last centimeter of the metal searcher, one can gently rotate the angled handle, thus giving the tip a variety of axes, in one of which it will engage and pass the stricture where the more flexible instruments will meet a pocket or shelf of mucosa and permanently obstruct. Usually after getting through the stricture area with the olive-pointed metal searcher, one can withdraw the searcher and immediately get by with one of the flexible catheters which has previously obstructed; or one can follow the metal searcher with the metal bulb dilator (*g*) which has a slightly curved olive tip followed by a metal bulb of 3 millimeters diameter, which bulb gives such thorough dilatation that the flexible catheter is quite certain to pass. At later treatments where a still greater dilatation is wished, the metal bulb dilator of 5 mm. diameter (*h*) may be used. It is seldom necessary to use this large metal bulb, for one can easily use the flexible catheters with a wax bulb as large as 6 mm. diameter. In using these very large bulbs it is well to see that the bulb is of perfect spindle shape, having no abrupt shoulder to catch on the stricture, and also to place smaller bulbs immediately in front and behind the larger bulb to give partial dilatation before the large bulb engages (*b*).

In our earlier work in testing for stone in the ureter we

always used beeswax (the cera flava or cera alba of the pharmacopœia) mixed with one-third or one-half sweet-oil, but I found that this softens the wax to such a degree that it partially crushes on meeting a narrow orifice, or later on meeting the stricture; sometimes on withdrawing the catheter, a part or all of the wax is left on the proximal side of the stricture. For this reason I have given up the mixed wax and oil and use only the pure beeswax. This is soft enough to get a good impression from stone, and it is firm enough to hang to the catheter and not crush under any ordinary conditions of obstruction.

At times on failing to get any of the above instruments to engage a stricture, I have succeeded in making the first dilatation by using the whalebone filiform searchers (*e*). Usually the first two or three searchers catch in the mucosa just as the other instruments have done, but after introducing three, four, or five filiforms, one can by careful manipulation get one of them through the stricture lumen, when by further manipulation the others will follow.

After dilatation with from two to four filiforms, one can withdraw these and pass the renal catheter with the bulb, but it is generally safer to leave one or two of the filiforms as a guide and pass the metal searcher or the flexible catheter alongside the filiforms to engage the strcture lumen before the guides are withdrawn.

Before beginning work with the whalebone filiforms one should have sterile hands or put on a sterile glove for these have to be grasped close to the speculum at a portion of the filiform that later enters the bladder or the ureter.

Finding by experience that the whistle-tip catheter often engaged and passed a stricture after the pointed tip had failed, and finding that the metal searcher with slightly curved tip was a most useful instrument, apparently because a rotary motion enabled the curved tip to pick up different axes of direction in the lumen, I combined these two ideas of a beveled tip, and a fulcrum to throw the tip into various axes, by using the wax on the end of an ordinary pointed

end catheter, in a fashion to make a corkscrew or spiral tip catheter (see Fig. 20). I have been successful in passing strictures with this spiral tip after failing with all other instruments. One can feel the rotation of the catheter as the spiral tip finds its way through the stricture.

Precautions in Technic. Experience has taught a few precautions which should be observed in treating stricture. If the history points to the probability of bilateral stricture never investigate both sides at the first examination, and in later treatments do not dilate both sides at one sitting until certain that the strictures are well dilated and that the kidneys will have drainage after the trauma of treatment. Case 16, Fig. 18, emphasizes these points.

Do not investigate or treat stricture too frequently. It seems to take about ten days in the average case for the traumatic edema of the early investigation to subside. This is particularly true if the last effort to dilate was a failure, for in such a case there is usually more trauma than in the case which takes the catheter and dilator with the first effort. If the patient is away from home and under the expense of hospital treatment he will likely be restive at the surgeon's apparent inactivity, and it is well to explain that greater haste is likely to defeat the desired end. For the cases who return to my office or to the dispensary for treatment I prefer to fix the interval at from two to four weeks or longer, according to the response.

In the pyelitis cases in which we are anxious to combine the pelvic lavage we may observe the ten-day interval for the first two or three treatments, or until we are quite certain of a good dilatation, then we may lavage twice a week, using a small catheter, Number 5 or 6, and once in ten days or two weeks use the Number 8 or 9 catheter with the large wax bulb for dilatation.

In any case do not use a large bulb for the first dilatation. A 3 or 3.5 mm. bulb will usually pass without splitting the mouth of the ureter and without too much trauma to the stricture area, although this small bulb may split the stricture

and cause some bleeding. It is not uncommon in the pyelitis cases to have a partial closure of the stricture area after the first one or two dilatations with the small bulb; this being especially true if these treatments are at short intervals.

The use of large bulbs measuring 5 to 6 mm. is not without its danger even after the patient has had repeated treatments. Case 35 with only one kidney (see Fig. 21) was ready to be dismissed as well when we undertook to make a final large dilatation. This evidently split her stricture area for she had intermittent suppression and passage of ureter clots and was in a precarious condition for several days until the bleeding stopped.

In 2 of my cases the use of too large a bulb or perhaps the presence of a too abrupt return shoulder on the wax bulb resulted in great difficulty in extricating the catheter, and on its return the shoulder carried a complete collar of mucous membrane torn from the stricture area. This of course represents an undesirable degree of trauma in the stricture area.

One must use care in the amount of force exerted in pushing the catheter in. If the stylet is still entirely in the catheter the end of the catheter may go through the ureter. This evidently happened in Case 36 and a silver nitrate injection of 1 to 1000 strength was left in the extraperitoneal tissues of the pelvic brim region. This caused much pain of a peritonitis character but no apparent permanent damage. In Case 29 the catheter went through the bladder portion of the ureter, penetrated the bladder mucosa, and curved back into the bladder.

If the stylet has been partially withdrawn there is probably no danger of the end of the catheter penetrating the ureter but forcible pushing may result in penetration of the catheter wall by the end of the stylet as occurred in a recent case without observable results.

Results of Treatment by Vesical Approach. What can we hope for in the simpler non-operative forms of treatment? In the cases without infection and without much renal dis-

turbance we can look for cure if distant foci of infection have been removed. Such was the result in eight of my first 50 cases. The case numbers, the duration of symptoms, and the pelvic contents before and after treatment are shown in the following table:

Case No.	Duration of symptoms.	Pelvis before treatment.	Pelvis after treatment.
15	A few weeks	30 c.c.	3 years later, 15 c.c.
17	5 years	22 c.c.	2 years later, 9 c.c.
21	2 months	15 c.c.	5 months later, 7½ c.c.
22	5 years before passed ureter stone	28 c.c.	5 months later, 10 c.c.
27	2 years	30 c.c.	Not seen after three treatments and complete relief of symptoms.
28	9 years	15 c.c.	3 years later no further attacks; pregnant for third time since treatment.
35	18 months	22 c.c.	4 months later, 10 c.c.
40	3 months	40 c.c.	Not seen after two treatments.

In certain other cases, even with infection, if the kidney pelvis is not too dilated, we get brilliant results in permanently clearing up the symptoms and the infection through dilatation and lavage. This occurred in 6 of my cases, 2 with bilateral stricture and pyelitis.

Case No.	Duration of symptoms.	Pelvis before treatment.	Pelvis after treatment.
34	11 years	Bilateral and no dilatation	Free of pus and bacteria.
41	1 year or less	30 c.c. staphylococcus	Free of pus and cocci. Pelvis contents 8 c.c. six months later.
43	4 months	Bilateral; colon, no dilatation	Free of pus and bacteria.
47	Pyelitis one week	11 c.c., colon	Free of pus and bacteria.
49	10 months	40 c.c., colon	Free of pus and bacteria; pelvis contents 30 c.c. two months later.
45	Pyelitis 3d month of pregnancy; 4 days' duration of symptoms	18 c.c., rod bacillus	One dilatation 5 mm. metal bulb; no further symptoms; examination one year later, urine normal.

In other cases with infection and large pelves we may be unable by lavage to rid the patient of infection, probably because of the permanently sacculated pelves; but we may restore them to apparent health by doing away with the ureter obstruction, thereby relieving their pain and their toxic symptoms (see Fig. 18).

In the following 2 cases with infection the patients' symptoms were relieved by treatment, but I have been unable to follow them with cystoscopy to learn of the final kidney condition.

Case 14, with attacks of pain in the kidney for two years, enlarged inflamed tonsils, and arthritis, had a stricture about 3 cm. from the bladder and a kidney pelvis of 12 c.c. capacity with a staphylococcus infection. After a few dispensary treatments she was lost track of.

Case 23 had a stone in the bladder with symptoms referable only to this. The *x*-ray picture revealed another small shadow in the left ureter region. On investigation this shadow was found to be outside the ureter, but the ureter had a stricture in the bladder portion and another about 4 cm. from the bladder. The pelvis of the kidney held 21 c.c. and was infected with colon bacillus. After a few treatments the strictures were well dilated and the pelvis reduced to 14 c.c. The patient went to her home in North Carolina before the infection was cleared, and a recent letter, four years after her treatment, states that she is perfectly well.

In another group of 3 cases each with bilateral, infected pyelitis, the method has not had a fair trial, because of a failure of the patients to persist with treatments after securing enough dilatation to free them from the severe attacks of pyelitis.

Treatment by Operation. If all the methods of vesical approach fail we must consider the operative relief. No form of operation will be undertaken until as complete an investigation as possible has been made of both sides. Stricture of the ureter being bilateral in 30 per cent. of the cases, we

cannot afford to take anything for granted in dealing with a case where symptoms may be confined to one side.

If investigation shows stricture of but one ureter, associated with a kidney of little or no functional value, conservatism usually calls for extirpation of the injured or dead kidney. This was done in 6 of my first 50 cases with entirely satisfactory results.

If the stricture is high at the junction of the pelvis of the kidney with the ureter, we may follow Fenger in doing some form of pyelo-ureteroplasty. Actual stricture at this point is extremely rare, and the valve-like obstruction formed by floating kidney can usually be overcome by mere high fixation of the kidney as I have done in a number of cases with excellent results.

If careful examination at the time of operation leads one to suspect an organic narrowing at the pyelo-ureteral junction, a pyelotomy and careful dilatation may be done in addition to the kidney fixation, or if the pelvis is very large, a partial pyelectomy may be done, being careful to dilate if the orifice into the ureter is at all narrowed.

Case 44, with symptoms of four years' duration had a stricture in the left broad ligament region and a kidney content of 360 c.c. of clear urine, the functional test being good and equal on both sides. I resected her kidney pelvis and later examination showed the restored pelvis to hold 7.5 c.c.

If the stricture is lower and about the lumbar or pelvic brim region it has been recommended to sever above the stricture and implant into the colon or in the loin region.

If the stricture is low and near the bladder, as a vast majority of these strictures are, it has been the custom to implant the severed healthy end into the colon or bladder. I have never made a colon implantation in these cases, but the results of Coffey's work on dogs[16] and of Charles Mayo's work on the human, using Coffey's method, would indicate that there is a field for this method. Some of these cases

have a degree of dilatation of the ureter which would make the operation easier than on the normal ureter, and some of them have such a wide dilatation of the ureter that the operation would be more difficult and the lowered resistance of the kidney would invite infection.

I have done bladder implantation in 2 of these 50 stricture cases with indifferent or questionable results in both. I say "questionable results," because in neither case could I later enter the ureter with a catheter from below. Both cases have been in good health since the implantation, but I suspect in both of these cases there may have formed stricture at the site of the implantation with gradual destruction of the kidney.

Retrograde Dilatation. I wish to emphasize a method for handling these cases by operation which I have not seen mentioned in the literature, but which I am sure must have been done by some surgeons and which has probably been described before, viz., the treatment by retrograde dilatation. Certainly every surgeon must follow his ureter stone extractions by dilatation of the usual area of infiltration about the stone.

The ureter is exposed by an extraperitoneal incision, incision is made into its dilated portion above the site of stricture, and increasing sizes of the French gum elastic bougies (Fig. 19, *d*) or metal sounds are passed until the stricture is dilated to a diameter of from 5 to 7 mm. The ureter incision is then closed with catgut. A wick drain is usually left in the extraperitoneal incision for forty-eight hours to take care of possible contamination by the escaped urine at the time of operation, or of postoperative leakage and the excessive serum secretion following the extraperitoneal operation.

If the dilatation has not been entirely satisfactory or if there has been much trauma to the ureter, I leave it open or close it carelessly with catgut to favor urine drainage in case of temporary swelling shut of the traumatized stricture

area. In such cases two or three small wicks are dropped to a point near the ureter incision and left some days or until there is certainly no urine leakage.

A McBurney incision is suitable for most of these cases, but a semilunar line incision is more useful, for it can be enlarged up or down to suit the exigencies of the case, and through a moderately long semilunar line incision one can easily palpate from kidney pelvis to bladder. With care one can preserve the intercostal vessels and nerves crossing this incision to the rectus muscle simply by deflecting them and working between them.

I have treated 8 cases by this retrograde dilatation, 5 cases in which it was impossible to dilate from below, 2 cases in which stricture of the ureter was found when stone was being looked for, and in 1 case in which ureter stricture had been successfully treated from the vesical approach one year previously, but in which the stricture again swelled shut sufficiently to cause kidney symptoms in the course of an attack of acute gonorrheal salpingitis.

The results in these 8 cases treated by retrograde dilatation have been perfect in 6, so far as measured by relief of symptoms and ability to easily catheterize later from below. In one case, my first one, in which I was looking for stone and failed to find it, but found the ureter dilated to 1 cm. diameter from the bladder to the dilated pelvis of the kidney I found a dense stricture in the bladder area and dilated it with the uterine sound only, which probably made a diameter of only 3 mm. I heard one or two years later that this patient developed symptoms again and had a stone removed from the kidney. I have questioned the accuracy of this report, especially as the patient had the kidney removed at a third operation. It is possible that I overlooked a floating stone temporarily lodged in a kidney calyx, but I think it more likely that the symptoms returned and persisted because the stricture was not sufficiently opened. My *x*-ray had shown a questionable shadow in the kidney region.

My second case, with a questionable result after retrograde dilatation, was one in which the stricture of the left ureter was a diffuse one, reaching from the bladder to 5 or 6 cm. above. She had stricture of the right ureter also, but had no symptoms on this side. A few weeks after retrograde dilatation she again showed signs of kidney obstruction, and I failed to catheterize from below. I attempted to make a ureterovesical implantation above the site of stricture, but failed to find the ureter in the midst of the scar tissue following the previous operation.

The patient got along fairly well, and when she was three months' pregnant, some three or four years later, her physician, at my suggestion, tried to catheterize her ureters, but was unable to enter either kidney. One would suppose that with the increased circulation and pliability of the tissues characteristic of the pregnant state this would be an ideal opportunity for dilating strictures of particular density.

The cases least suited for retrograde dilatation are those in which previous testing of the capacity of the pelvis of the kidney and ureter and pyelography have shown an absence of marked enlargement of the lumen above the site of stricture. In these cases the ureter is found too small above the stricture to admit large dilators, and if it is at all possible to get by from the vesical approach, one should be satisfied to do as well as possible by this route, although it may require a long, tedious course of treatment.

I cannot speak with authority concerning ureter stricture work in the male. Because of the restriction in the use of instruments it is probable that retrograde dilatation will be resorted to much more frequently in the male than in the female. Dr. Bransford Lewis has devised a clever flexible metal dilator which will undoubtedly be of use in some cases. In many cases this instrument will be found to be too blunt to get by the stricture area. Those who use male instruments that take an eight or nine renal catheter will be able to relieve many cases merely by passing the catheter, par-

ticularly if the dilatation can be repeated every few weeks or months. In the past many cases of hydronephrosis and of pyelitis due to stricture have been improved or cured of their symptoms without discovery of the stricture, because the passage of a renal catheter gives sufficient dilatation in some cases to result in good drainage.

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TRANSPLANTATION OF THE URETER FOLLOWING TRAUMATISM AND RESECTION OF THE BLADDER FOR CANCER

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Ureteral fistulas have occurred following traumatism and following operative procedure. Removal of the kidney to which the damaged ureter belongs has not been at all unusual in the past, and this procedure will continue to be the best method of treatment for those cases in which a considerable part of the ureter is involved, so that transplantation to the bladder cannot be performed. Before the kidney with the damaged ureter can be removed it must be demonstrated that the remaining kidney is functionally sufficient. The principal indications for ureterocystotomy have been threefold: (1) injury to the ureter during hysterectomy, usually for advanced carcinoma of the cervix; (2) resection of the bladder for cancer located about the ureteral orifice; (3) traumatism of the lower end of the ureter during difficult instrumental labor. Long [1] reports successful transplantation of both ureters following a hysterectomy for cancer of the cervix with involvement of the base of the bladder. He gives also the important features in the technic. Paton [2] reports successful transplantation of the ureter on account of traumatism which occurred during an operation for cancer of the cervix and resulted in ureterovaginal fistula. Torrance [3] reports a case of

transplantation of the ureter from the vagina to the bladder twenty months after a Wertheim hysterectomy. He buried the ureter for some distance in a trough of bladder wall. His case is especially important because he demonstrated that the ureter was patent and functionating two months after the operation. In a case of difficult labor at the Lying-in Hospital, New York, Markoe [4] transplanted the lower end of the ureter to the bladder and obtained a good result. Kelly and Burnam [5] state that ureterovaginal fistula following labor is not uncommon, though they do not mention having operated on cases of this nature. Kelly reports one case of double ureterovaginal fistula in which, operating through a vaginal incision, he obtained a good result by turning both ureters into the bladder.

We have performed ureterocystotomy (1) in two instances for ureterovaginal fistula following hysterectomy, (2) on two occasions for ureterovaginal fistula following labor, and (3) in 17 cases in conjunction with resection of the lower end of the ureter and a quadrant of the bladder for cancer.

Case I (102891).—A woman, aged forty-one years, had had a hysterectomy performed elsewhere. The history showed that clamps had been left on and a gauze pack put into the vagina, and that urine had come into the vagina very soon after the clamps and pack were removed. Five months afterward we transplanted the ureter, which was dilated to about twice its normal size, showing that there had been some obstruction.

Case II (144658).—A woman, aged forty-two years, had had a very difficult abdominal hysterectomy performed in our clinic in February, 1916. In this instance the ureter had been apparently partly tied off as we suspected at the time of the hysterectomy and a fistula had resulted. Shortly after the hysterectomy we made an effort to pass a catheter and found that the ureter was not patu-

lous. At the time we operated to transplant the ureter we found it dilated to about twice its normal size and there was much scar tissue at the ureterovaginal juncture.

In both instances in which fistula followed hysterectomy the ureter was transplanted without much difficulty and the wound healed primarily. Cystoscopic examination made about three weeks after each operation showed that the ureters were open and that urine was coming into the bladder through them. Recent reports from these patients state that both have remained well. In one instance twenty months and in the other eight months have elapsed since the transplantation of the ureter.

The two cases in which ureterovaginal fistulas developed following labor were of special interest to us because of the rarity of the condition. They are the only two cases of the kind that we have seen. In talking with Dr. Markoe, who has had a very large obstetrical experience in the Lying-in Hospital of New York, he stated that his case mentioned above was the only one that he had seen.

Case III (130856).—A woman, aged twenty-nine years, had gone through a very difficult labor three years previously. Six months after childbirth she had been operated on for vesicovaginal fistula and had obtained partial relief. Later she was again operated on by abdominal incision but obtained no further relief. At the time she consulted us examination showed that she passed about half her urine in the normal way and had perfect control of it. In spite of this, however, her clothing was continually soiled by urine which leaked into the vagina. Cystoscopic examination did not reveal an artificial opening into the bladder and ureteral catheters could be passed into both ureters without obstruction. However, with a vaginal speculum a small opening could be seen in the right side of the vagina just above the base of the bladder, from which urine was draining. A catheter was put into the right ureter and the

urine drained through it for a number of days. Meanwhile there was no evidence of leakage through the fistula. Since the opening was so small and it was found possible to control the urine by ureteral catheter it was thought that freshening the edges of the fistula through the vagina and placing a few stitches across the opening would probably close the fistula. We attempted to do this and left a ureteral catheter in place for ten days. During this period there was no leakage, but just as soon as the catheter was removed the urine drained into the vagina as it had previously. An abdominal extraperitoneal incision was then made. The ureter was freed down to the bladder and the lower segment tied off. The upper segment was transplanted into the bladder wall. Since her labor the patient had had several attacks of what appeared to be pyelitis, accompanied by chills and fever. She had had pain in the region of the right kidney. Ten days after the ureter was transplanted she had a similar attack, and for a few days urine drained through the abdominal wound. However, at the end of four weeks her wound was entirely healed. Her temperature and pulse had been normal for some time. Cystoscopic examination showed that the ureter was functionating, although at times there was considerable pus in the urine which came down from the right kidney. I operated on this patient in August, 1915. In a recent letter she says that since the transplantation of the ureter she has had no further attacks of chills and fever, and has remained entirely well.

Case IV (143263).—A woman, aged twenty-seven years, came with a uterovaginal fistula complicated by a vesicovaginal fistula which had been operated on twice before we examined her. Although transplantation of the ureter, performed April 1, 1916, improved her condition considerably, the last time she was seen there was still slight leakage from the vesicovaginal fistula. At this time

she was about three months pregnant. A few weeks ago we received a report from her in which she stated that leakage of urine had almost entirely ceased and her condition had improved.

In the 17 cases of cancer of the bladder very satisfactory results were obtained by transplantation of one or both ureters. Many of these patients were operated on for very extensive cancers of the bladder; some of them have since died of a recurrence. We have been able to trace other patients for several years, and during that time have examined them repeatedly with the cystoscope. In one instance, three years after the operation, the ureter was functionating very well. In a few cases during cystoscopic examination we observed that the urine flowed from the transplanted ureter into the bladder almost continuously rather than by spurts as under normal conditions. In other instances the urine seemed to enter the bladder normally. It is probable that the continuous flow of urine was the result of a chronically infected ureter in which peristaltic contractions could not take place because of the thickened walls. In none of the cases was there a permanent urinary fistula, though there may have been small amounts of leakage for short periods.

In every instance in which we have been able to make a cystoscopic examination at any time after the transplantation of a ureter we have found the ureter open. In a few cases it could not be catheterized, although the urine was coming through it into the bladder. It seems entirely probable that a stricture might form and close the ureter completely, but as far as we have been able to determine this has not occurred in our cases except possibly in one case of cancer. However, in the case in which the ureter was practically ligated at the time the hysterectomy was performed very little urine had been coming down from the ureter for two weeks previous to the ureterocystotomy.

We were in doubt as to whether there would be a great deal of function in the kidney, as the ureter had been ligated so long. A few weeks after transplantation of the ureter a functional test of the kidney was made. Although there was some function on the traumatized side, about five-sixths of the return was through the normal kidney. In this connection I may also mention two cases in which one ureter was deliberately ligated at the time of the operation for resection of a part of the bladder for cancer. The ureter was ligated because it was impossible to make it reach to the bladder, and since the operation had already been extensive it did not seem advisable to transplant the ureter into the intestine. In both instances the ureter was considerably dilated, and evidently had been obstructed by the growth for some time. The ureter was ligated with the idea of doing a nephrectomy later if advisable, but in neither case was nephrectomy necessary nor was any difficulty apparent from this procedure. Both patients were operated on more than a year ago and are alive at the present time. One has a recurrence in the bladder and a urinary fistula has developed from the bladder in the suprapubic wound, which remained closed for a number of months after the operation. In neither case have we been able to palpate the kidneys at any time.

Technic. The same technic was used in all the traumatic cases. A straight rectus incision was made from the symphysis almost to the umbilicus (Fig. 1). The peritoneum was dissected back and the ureter exposed (Fig. 2). In one instance the peritoneum was opened. The ureter was liberated as far down toward the bladder as possible. In each instance there was considerable scar tissue and the dissection was continued into it (Fig. 3). The ureter was divided between clamps and the lower end ligated with plain catgut. The ureter was liberated from its bed sufficiently to make the anastomosis into the bladder free from

tension. In each instance the choice of the region in the bladder for transplantation depended on the amount of freedom from tension that could be obtained. The end of the ureter was split for a short distance and a small opening made into the bladder. We think it is essential that the end of the ureter should project into the bladder for a short distance. In order to hold it in place, each of the two parts of the split ureter was stitched by a plain catgut suture to the mucosa of the bladder (Fig. 4). The coats of the bladder were then accurately stitched around the ureter. We endeavored to pass the ureter obliquely through the muscular walls of the bladder so that it would simulate the normal course. We never use anything but plain catgut for the sutures inside the bladder. Fine chromic catgut is used to stitch the ureter to the surrounding structures (Fig. 5). Usually there was a little soiling from urine during the operation, and in each instance a small drain was placed in the wound. In resections of the bladder for cancer the transperitoneal method suggested by C. H. Mayo was employed. This technic is safer and more accurate for these cases, because the peritoneum can be carried with the ureter and the peritoneal covering of the bladder makes an accurate closure. In the cases in which the transperitoneal method was used the wound healed primarily and none of the patients had any urinary leakage.

Since 1908 we have performed intravesical transplantation of one of the ureters in 17 patients suffering from carcinoma of the bladder; 13 of these patients were males and 4 were females. The average age was betwen fifty-four and fifty-five years; the oldest patient was sixty-seven and the youngest thirty-three years of age. The average duration of symptoms was one and one-half years; the longest history was five years and the shortest two weeks. In each instance, with the aid of the cystoscope, a clinical diagnosis of malignancy of the bladder was made; the

FIG. 1.—Regular suprapubic incision with recti muscles cut. Bladder still in place.

FIG. 2.—Peritoneum and fat dissected from top of bladder.

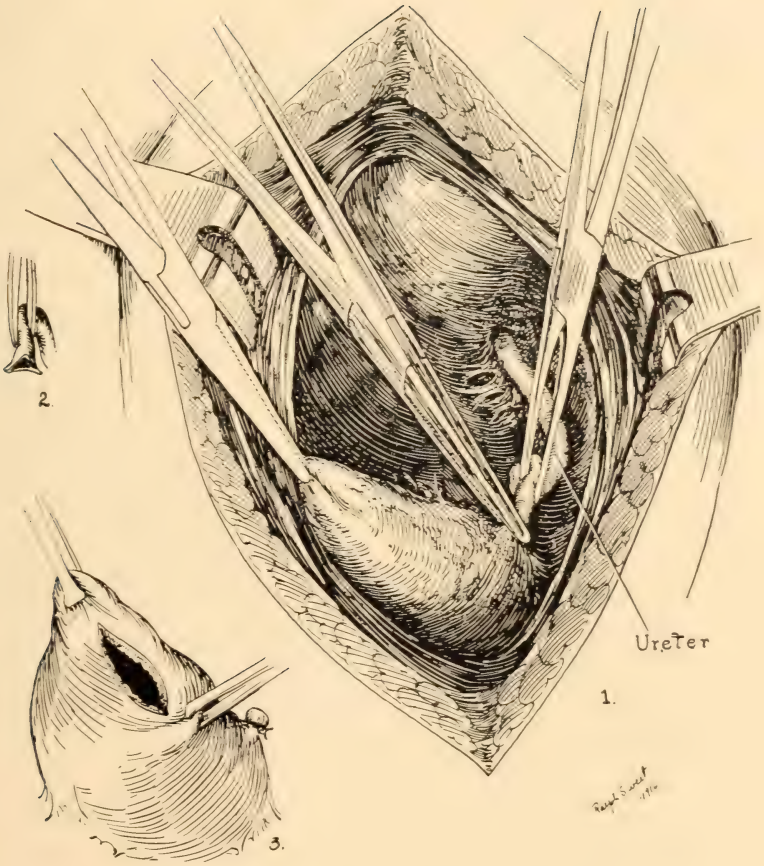

FIG. 3.—*1*, from four to six inches of ureter dissected out and clamped in place prior to cutting; *2*, cut end of ureter which is to be transplanted; *3*, bladder opened and ready for transplantation of ureter.

FIG. 4.—*1*, interrupted suture placed on the ends of the transplanted ureter; *2*, starting to close bladder; *3*, bladder closed with ureter in place.

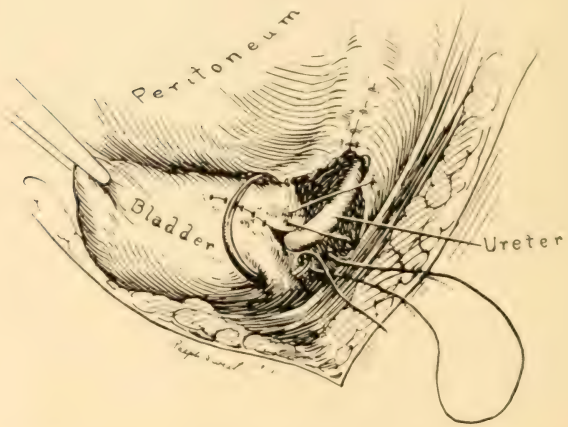

FIG. 5.—Drawing tissues around ureter and bladder to hold ureter in place.

surgical diagnosis was carcinoma, and the pathologist's report substantiated these opinions.

From one-third to two-thirds of the bladder was resected and the ureter transplanted into the remaining portion. Three of the 17 patients died in the hospital, an operative mortality of 18 per cent. One lived five days; one six days; and one twenty-three days. Necropsy showed that the patient who lived five days had an acute nephritis of the right kidney (left ureter had been transplanted) and left hydronephrosis. The second patient died on the sixth day from toxemia from extravasated urine. The third death, at twenty-three days, was due to an acute nephritis superimposed on the chronic condition. In this instance the right ureter had been transplanted, and at necropsy it was found that it had been obstructed. There was a blood clot in the ureter and in the pelvis of the right kidney. This patient also had a marked arteriosclerosis. Eight of the patients who survived the operation have since died. The average length of life was two years and one month. One patient lived seven years.

Patient 5756 lived three years and nine months, after transplantation of the ureter. His physician wrote us that death was due to carcinoma of the stomach. This patient had returned to our Clinic nine months previously, at which time his general health was fair. His prostate was very hard and firm, his inguinal glands hard, and his legs swollen.

Patient 23326 lived one year and five months. He gained in weight and strength for seven months following the operation, but died from recurrence.

Patient 24745 lived seven years. He gained 40 pounds in the three years directly following the operation. His physician wrote that death was due to heart failure.

Patient 34725 improved slightly but died in two months.

Patient 48717 lived two years and one month. He

returned for examination seven months after resection of the bladder and transplantation of the ureter. There was a recurrence of the carcinoma in the bladder, including the area into which the ureter had been transplanted. The transplanted ureter was not visible. The area was cauterized with a high-frequency current. The patient returned five months later and the high-frequency current was again applied. His last visit was eighteen months after the first operation, and at that time we explored the bladder but found the condition inoperable.

Patient 86767 lived one year after the operation. In the meantime his symptoms had returned. One month before his death he came back to the Clinic and we operated for the recurrence in the bladder and for stones. He died on the twelfth day following the operation.

Patient 92613 lived six months after the operation. For three months he gained in weight and strength.

Patient 99860 lived five months after the operation. At the time of the resection the carcinoma was broad-based and very extensive. Half of the bladder was resected. His general strength improved following the operation, but he died of a recurrence in the bladder.

We know that five of the remaining six patients are alive at the present time. We have been unable to obtain a recent reply from the other patient, who was operated on in 1913, but when last heard from he was in good condition. The following are short reports of the condition of patients still living.

Patient 42568 wrote us six years after the operation that he was in good condition and had gained in weight. One year and seven months after transplantation of the ureter we removed a stone from the bladder, and there was no evidence of recurrence of the malignancy.

Patient 69825 had a third of the bladder resected for

carcinoma and the left ureter was transplanted. He returned for an examination nine months after the operation and a cystoscopic examination showed the transplanted ureter functionating normally—clear urine spurted from the left meatus and there was no evidence of a recurrence of the carcinoma in the bladder. In a letter four years and one month after operation he states that his condition is good, that he urinates four or five times a day and about once at night. He has no pain and has not observed blood in his urine.

Patient 80914 came to the Clinic with a broad, flat carcinoma of the bladder extending to both ureteral orifices. In August, 1913, the growth was excised and the right ureter transplanted. This woman has returned several times for examinations. Two years and five months after operation the cystoscope showed that the right ureter was functionating normally, but there was a recurring malignant caruncle. This was removed with the clamp and cautery. Nine months later (October, 1916) she returned in good condition. Examination with the cystoscope showed that the right meatus was normal. There was no evidence of recurrence of the carcinoma either in the bladder or the urethra.

Patient 86191 had the right quadrant and floor of the bladder resected and the right ureter transplanted for carcinoma. She has returned four times for examination. Her last visit was in November, 1916, three years and three months after operation. Her general condition was very good. She had had some frequency and burning on urination for the past six months. Cystoscopic examination showed that the transplanted ureter was functionating normally. However, the edges of the ureter appeared to be somewhat reddened and roughened. Otherwise it was normal and no evidence of a carcinoma of the bladder could be found.

Patient 88992 has not returned for examination, but wrote to us three years after his operation that he felt well. He says that he urinates three or four times during the day and night, has no pain, and has not observed any blood in the urine.

From this review of our cases we would conclude that transplantation of the ureter to another section of the bladder can be performed and the function of the kidney maintained. It seems that this is entirely feasible, that it is the procedure of choice in cases of ureteral fistula, and that it is much to be preferred to sacrificing the kidney.

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DISCUSSION ON THE PAPERS OF DRS. JACKSON, HUNNER AND JUDD

DR. R. C. COFFEY, Portland, Oregon.—At the meeting of the American Medical Association, held in 1910, I reported some experimental work on implantation of the ureter by running the ureter along the mucous membrane three-quarters of an inch before it entered the intestine. We reported the first series of ureteral implantations into dogs' intestines that had been successful. In this series we reported 9 cases with 3 deaths from peritonitis, 6 recovering, the time between operation, removal of the specimens ranging from four months up to one hundred and sixty-seven days. In the 6 cases there

was no ascending infection; there was no dilatation of the ureter, and so far as we could determine the results were perfect.

We tried to secure the same results by direct implantation, and found ascending infection with destruction of the kidney in all cases We have since that time implanted four ureters in the intestine in human beings, one a double implantation, one ureter being implanted at the time for exstrophy of the bladder, which was done three years ago. That patient is in perfect health today. There is no evidence of ascending infection or anything of the kind.

We have had 2 cases of cancer of the bladder in which one went along for eight months with the ureter functionating perfectly, and the other I have not heard from. The operation was done a little over a year ago, and the patient may have died of cancer since that time.

Dr. Charles Mayo did this operation on the human before I did. He reported 6 cases in which he implanted both ureters. He stated at that time that they were all successful, and so far as known there was no ascending infection. I do not know whether others have tried this or not. I wrote Dr. Mayo a letter. asking him how many of these operations he had done, and he replied that he thought he had done about a dozen cases. In the work we have done it has been a success. I have not heard lately any reports from Dr. Mayo to know what the ultimate results in his cases have been.

Dr. J. Wesley Bovée, Washington, D. C.—These papers are very interesting to me, and I hoped we would hear from some of the gentlemen who have been pioneers in working along this line.

I think the matter of implantation of the ureter into the bladder for injuries, however, is an operation that should be avoided. It is one in which we must expect, as a rule, bad results. These bad results are almost exclusively due to (where we have immediate success in the operation) constriction at the point or too large an opening. We get a backing up of urine in the ureter and in the pelvis of the kidney which, sooner or later, does away with the use of the function of the kidney if you have too large an opening at the point of junction, you have the ureter acting as a part of the bladder itself and a constant reservoir; you have the same result in the kidney and ureter as though you had a constriction there. This will, sooner or later, give trouble.

Dr. Sampson of Albany holds the same opinion that I do in that respect. Such cases as these have been reported. In a case of ureteral fistula, if it is possible, and this particularly applies of the ureter is constricted at the site of injury, say two inches away from the bladder, an important feature is to try and repair the opening without removing a portion of the ureter. You may do the Heinecke-Mikulicz operation at that point if you fear constriction in closing the fistula, but retain by all means the ureterovesical junction which we cannot very well do in the operation that Dr. Coffey mentioned. Fully eighteen years ago this same experiment that Dr. Coffey mentioned of implanting ureters, carrying them along the rectum just underneath the mucosa three-quarters of an inch, was tried and given up because of the bad results always of ascending infection. If we have to do away entirely with the ureterovesical junction, and particularly where we do not want to sever the ureters, we can take a part of the bladder with it. The implantation of the ureters into the intestine is not nearly as good an operation as the Maydl or, still better, the Pozza operation of implantation into the rectum of both ureters with a portion of the bladder with which they are connected and allows retention of the junction. I cannot give you the exact percentage of cases of infection following intestinal implantation of the ureters, but it is probably 90 or more per cent., with death of the individual, sooner or later, from ascending infection Some of these cases have shown symptoms of infection as late as several years after the operation had been done. I would say, in connection with ureteral fistula, try to repair the main fistula without sacrificing the ureterovesical junction, and avoid stricture of the ureter at the point by the method of suturing. I would like to say also in a good many of these cases that healing will take place spontaneously.

Dr. Robert Lee Payne, Jr., Norfolk, Virginia.—I have been much interested in experimental work on the ureters for many years. As far back as 1906–07 we carried out a series of experiments on ureteral anastomosis, and very many interesting points, which many of us did not know about, were discovered in these experiments. In the first place, there is no structure in the body that heals more kindly and lends itself more readily to surgical intervention than the ureter if it is handled properly.

The success of surgical procedures on the ureter depends, first, on the blood supply, which is a rich, vascular peri-ureteral

plexus that surrounds the whole organ. A second factor is the extreme gentleness with which to handle the ureter in order not to compress or injure it and set up thrombosis of this peri-ureteral blood supply.

Dr. Jackson in his paper said that where the ureter was cut accidentally, one of the various methods shown in his illustration should be employed to produce anastomosis. That I would like to qualify. The Weller Van Hook method of end-to-side or end inside anastomosis, or the Bovée oblique anastomosis, we have shown conclusively in the dog, will result in a stricture and scar tissue at that point, and a stricture resulting from the anastomosis will always cause damage to the kidney through hydronephrosis and infection—infection from faulty drainage. The only method of anastomosis of the ureter proper should be an end-to-end anastomosis, and that cannot be done successfully by picking up the ureter with ordinary clamps and squeezing it. The ureter should have a long, straight needle pushed through its wall from within out, that should be caught with two hemostats on each end and the ureter suspended. Four small fine silk sutures put through the wall, care being taken not to penetrate the mucosa will suffice for the anastomosis. These reports were not published because we did not think they were worth while.

I did report in 1909 (*Jour. Am. Med. Assn.*) a method of anastomosis described by Dr. Jackson today in the operation of implanting the ureter into the bladder. It is the flap operation that Dr. Jackson showed on the screen, and that operation will prevent a stricture occurring at the site of the anastomosis. A most important point in doing ureterovesical anastomosis is securing a sufficient length of ureter, especially in the traumatic cases, and one of the essayists said this morning that the ureter was not long enough to reach the bladder, and in that event, the bladder might be dissected free and sewed to the white line. I have reported a case in which that has been done. He said further, in those instances where it could not be made to reach the bladder, the ureter should then be anastomosed to the bowel. In 1908 I reported the first case on record in which the kidney was lowered on account of a shortened ureter, and that permitted transplantation into the bladder.

Dr. Howard A. Kelly, Baltimore, Maryland.—I am much interested in ureteral strictures. Dr. Hunner has made this field peculiarly his own and I for one did not recognize the fact that there are so many mild infections which are likely to pro-

duce ureteral stricture. His work demands consideration and whatever our opinions may be, this field should be subjected to the most careful investigation and final judgment, and its importance must be held under advisement. For years I have been treating the more pronounced cases of ureteral stricture, and have some examples at present on hand.

Dr. Mann of Buffalo sent me my first case in 1888—ureteral catheterization demonstrated a stricture at the lower end of the ureter, but it was not until months later that we recognized that the patient had a tubercular kidney. This was removed in 1891, the patient living in fairly good health until last year, when she died from some other cause than renal.

My second ureteral stricture was in a Mrs. S. from Cincinnati. The etiological factor in this case was gonorrhea. In this patient a complete cure was effected by dilatation of the stricture and appropriate lavage treatment to the ureter. The cure has now remained permanent for nearly twenty years.

About six or eight years ago an interesting case in a minister came under my observations. He was having attacks of colic in the left side. An exploratory laparotomy disclosed a congenital stricture of the upper end of the left ureter just before its entrance to the pelvis of the kidney. I opened the pelvis of the kidney and dilated the ureter widely with bougies. In this case too there was apparent permanent relief, or at least relief for several years. The patient died finally of brain tumor.

A very interesting observation was made within the past week. The patient, a woman, complained of vague pains in the right side. These pains had been present for some months and she had been advised to have the gall-bladder and appendix regions explored—the right kidney was movable. Injection of the kidney with sterile salt solution reproduced a pain identical to that of which she complained. A suspension of the kidney was advised and accepted. At the operation it was found that the kidney pelvis was greatly distended and the ureter below it, as far as could be seen. The kidney was suspended into place. The patient was placed on her back and incision was made over the appendix region. Normal appendix found and removed. Normal gall-bladder observed. The pelvic organs showed no evidence of disease. After closing the appendix incision a cystoscope was introduced into the bladder and a two and three-quarter millimeter catheter was introduced into the ureter. In introducing this rather large-sized catheter an

obstruction was met in the lower end of the ureter. This was overcome by slight twisting and screw-like motion. In this case there was no evidence of infection whatever in the urine.

I should emphasize that the dilatation of the ureter cannot as a rule be done at one sitting but should be carried out in twenty or more, beginning with the small size and dilating every two or three days until the size desired is reached.

I would like to comment on Dr. Jackson's very interesting paper. In recent years greater care on my own part has resulted in very much less ureteral injury in the course of pelvic operation. One ought practically never to have a ureteral injury, and yet I must confess to having had one within the last two weeks. In the case of a dilated ureter, where a transverse incision is made, excellent results are obtained by an end-to-end anastomosis. The Weller Van Hook method, which consists of the slipping of one end of the ureter into the other, is an admirable plan and gives satisfactory results.

In cancer of the neck of the uterus and cancer of the cervix uteri, it is rare now to see a fistula following operation. This may partly be due to the fact that I am using radium in the extensive borderline cases now, and reserving operation for the clearly operable cases. In doing a typical Wertheim operation, it is most important to roll the ureters over in their beds and not detach them. Formerly I, and I think many others, dissected the ureters free, leaving them as bare bridges.

What Dr. Payne said is very important. The ureter should always be handled with the utmost delicacy and great care should be exercised in avoiding pinching or injuring its vessels. I should like to emphasize the great surgical importance of the sheath that envelops the ureter. William Mayo has pointed out that there is a delicate sheath that envelops the pelvis of the kidney which should not be rudely brushed aside or pushed off. This same sheath extends down the ureter and is one of the best assets in closing it. Closing this fascial sheath alone will cause a ureteral wound to heal.

In old fistula cases no effort should be made to save the kidney unless careful functional test methods demonstrate it to be in efficient working order. Most of these cases are almost functionless, and in such a case it is much better to do a nephrectomy. However, if the opposite kidney is not good and there remains a reasonable degree of efficiency, every effort should be made to save it.

Dr. Charles R. Robins, Richmond, Virginia.—I have recently been interested in the question of stricture of the ureter, and my interest was stimulated by the fact that I had a case which illustrated the pathology of this condition. I would like to mention this case briefly, and one other case, as I think they bring up a great many points that arise in the discussion of this condition.

The first case that occurred was one that came to me for bleeding uterus due to fibroids. The woman gave a history of having had the left kidney removed by Dr. Finney about ten years previously. On account of the fact that she only had one kidney left, we made a very elaborate examination and we were able to detect no trouble with the right kidney. Hysterectomy was performed without any untoward results except that as she was convalescing from operation she developed a very high degree of pyelitis in the right kidney. Having only one kidney to deal with, it gave us a considerable amount of concern. This was treated by lavage of the kidney, and after a rather slow convalescence lasting for a long time, she finally made a recovery sufficient, at any rate, to go home. Her fever, which was very high and subject to extreme exacerbations, had gone down to normal, and she was ready to go home, although some pus still existed in the kidney.

In reference to lavage, this was practised at regular intervals. It was done a number of times, and at none of these times did we discover anything that suggested to our minds she had a stricture of the ureter. She, however, left the hospital and went back to her home in Charlottesville, where she had a return of fever and chills, with enormous quantities of pus in the urine. She subsequently fell into the hands of Dr. Hunner, who made an examination in her case and discovered one of these ureteral strictures of large caliber that Dr. Kelly referred to—one that did not interfere with the passage of the ordinary ureteral catheter into the kidney. Dr. Hunner dilated this stricture and treated her by lavage. I think that was about two years ago. At any rate I saw this woman recently and she is absolutely the picture of health. She said she has had no return of the pyelitis since treated by Dr. Hunner by dilating this stricture. I thought the case was extremely interesting, because I believe Dr. Hunner discovered the real seat of the trouble, which was stricture of the ureter.

I wish to report briefly another case that was likewise very

instructive. This was a patient on whom I operated many years ago for double pyosalpinx of gonorrheal origin. She made a recovery from the operation. Subsequently she developed a right-sided pain and temperature, which was diagnosed as a case of pyelitis, and was treated for such and she made a recovery. Subsequently she was taken with violent pains, and while she was out of Richmond she was taken to another surgeon, who diagnosed her case as acute inflammation of the gall-bladder. Possibly, he said, it might be an appendix case. He operated and found nothing wrong with the gall-bladder, and could not find the appendix, although it was there. She got over that and made a recovery. Subsequently she came back to me because she still had pain in the right side. I did not want to operate on her any further because she had become I thought a neurotic. I did not know how much pain she had in her side and how much she had in her head. She continued to suffer with pain. She gave a history of having pus in the urine at intervals. I had *x*-ray pictures made and discovered no calculus in the ureter, and came to the conclusion she had a post-cecal appendix which bore some relation with the ureter and had something to do with the return of pain with pus in the urine. I removed the appendix and found it post-cecal. She went along for a while fairly well, then was taken sick again, and it was about that time everybody was taking out the colon for things they could not explain otherwise. So not being willing to operate on the patient, because I regarded her as a neurotic, I called on my friend Dr. Bloodgood, and Dr. Bloodgood came down and took out her ascending colon, doing the usual operation as you know. She made a recovery from that operation, but she was not relieved entirely. I think Dr. Bloodgood regards her as one of his black marks. At any rate, she continued to have trouble, and then we sent her to an internist. I had been seeing her for fifteen years at intervals. He worked over her and discovered that she had a duodenal ulcer he thought. At any rate, I told him not to send her back to me, but to send her to Dr. Bloodgood, who went over the case and he and others concluded she did not have duodenal ulcer. The case came back to me again, and Dr. Geisinger did the cystoscopic work on her, and he found she had two ureters on the right side. One of them had a pyelitis and the other one was clear. He found a stricture in the ureter that had the pyelitis, and he dilated that stricture, and the patient then had a period of more comfort than she had had for

the balance of the time preceding. Twelve months ago he dilated the stricture. She has had some further pain since then, and the stricture has been dilated again. We have discovered that she had, in the meantime, developed the morphin habit, which is only natural for anybody who has been through all that trouble.

The point that interested me about these 2 cases is this: I wrote the Hopkins people and got a report on the kidney that Dr. Finney took out many years ago. and the pathology reported suggested to me that it originated from a pyelitis. I believe that there was a stricture in the left ureter of the kidney that Dr. Finney removed so many years ago. She had a stricture in the right ureter which was finally cured by dilatation.

I believe in this other patient that I have just told you about, who was operated on fifteen years ago, most of the pain was due to ureteral stricture, and if I had known enough to have discovered that many years ago I would have cured the patient and saved her a great deal of trouble in operating.

Dr. George Tully Vaughan, Washington, D. C.—I have enjoyed these three papers very much. Dr. Hunner told us a great deal about the causes of stricture of the ureter, and one of the other essayists told us about a point I was going to mention in connection with appendicitis. I have seen 2 or 3 cases—2 I recall now—in which temporary or permanent stricture of the ureter existed. One of these cases was a young man, aged twenty-four years, who had trouble in his right side of a chronic character off and on. I examined him carefully, and in using the cystoscope found no urine coming from the right ureter. I operated on him for trouble with the appendix, which was inflamed and there was inflammatory tissue surrounding the ureter. The ureter above this point was dilated, and below it was very small. The appendix was removed, tissue dissected off, urine passed down, through the constricted portion of the ureter on into the bladder. I followed the patient for about six months and he continued to pass urine from that side, after which time he passed from under my observation.

I have not time to mention several other things I would like to discuss, but will pass on to the consideration of ureterovesical anastomosis. I remember 2 cases of that kind I had over ten years ago. One of them was caused by a gunshot wound which destroyed a part of the ureter. A fistula resulted, discharging urine on the skin of the abdomen. The abdomen

was opened, the proximal end of the ureter found, and as it was too short to unite with the distal end, I transplanted the ureter into the bladder very near the fundus. The technic consisted in opening the bladder by a good-sized incision, bringing the end of the ureter into the bladder through a small opening, and splitting the end and attaching it to the inside of the bladder with catgut sutures. That patient was examined one year afterward, was cystoscoped and the ureter found functioning normally. In a second patient in whom the same operation was done, I do not know what the result was so far as the function of the ureter was concerned, but she died from recurrence of cancer some years later.

Dr. J. M. T. Finney, Baltimore, Maryland.—Referring to the remarks made by Dr. Robins, I do not recall what the indications were that caused me to remove that kidney to which he referred. My only plea is that it was done fifteen years ago and nowadays the indications for nephrectomy are a little different from what they were at that time.

I am glad to have heard the report of this case, and if I made a mistake it was not the first one that I have made, and I am quite sure it will not be the last.

Dr. John B. Deaver, Philadelphia, Pennsylvania.—I am fully in accord with Dr. Judd's conclusions. I am impressed with the simplicity of his method and the directness of attack. Personally I have had little experience with injuries of the ureter. I might mention two or three instances in which the ureter was injured, and I have disposed of them as Dr. Judd has done. I think we regard an injury of the ureter too seriously. Fancy surgery is time-consuming, and simplicity of operation is much more effective; I am fully in accord with my friend Dr. Judd in that regard. I have seen one case of fistula between the intestine, ureter and vagina get well after removal of the kidney on the affected side This was a case of uretero-intestino-vaginal fistula. I kept this patient in the hospital a few days before operating in order to determine the best thing to do. Cystoscopy showed ureteral involvement as well as infection of the corresponding kidney, also that there was a second kidney that functionated normally. Nephrectomy of the affected kidney sufficed to establish closure of the fistula.

Dr. John Wesley Long, Greensboro, North Carolina.—Dr. Deaver is good enough to refer to me in the case which he has just reported. It is true that I operated upon a patient who

subsequently fell into Dr. Deaver's hands. I did a hysterectomy under very trying circumstances. It is not necessary to go into details but simply to say that a ureteral fistula—and strange as it may seem, about three weeks later a fecal fistula—developed. Neither fistula was large but was sufficient to cause great annoyance.

I was feeling rather badly about this case, especially after the patient was taken to Dr. Deaver, since no one likes to have it advertised that his operation has been followed by unpleasant sequelæ. However, my feelings were much relieved on reading about this time in the *Journal of the American Medical Association* for October 21, 1916, page 1218, a certain article by Dr. Deaver, in which he reports his cases of hysterectomies Among this vast array of brilliant hysterectomies done by Dr. Deaver there was at least one patient who developed *both a urinary and fecal fistula* following her operation

Dr. Jackson (closing on his part).—I would like to discuss Dr. Hunner's paper on stricture of the ureter if I may. I understood the doctor to say that the usual cause or the more modern etiologic factor of ureteral stricture is embolic infection. I have been taught and have understood that the diplococcus of Neisser was the microörganism whose sins made him work in the dark, and, as a matter of course, caused nearly all strictures. Dr. Murphy used to say that the stricture organism is the diplococcus of Neisser. This organism works in the rectum, the urethra, the ureter, and everywhere else, and as an evidence we find strictures of the ureter always in the lowest portion of ureter nearest the bladder where gonococci operate most.

I believe that stricture of the rectum in the majority of cases is due to the gonococcus and not to syphilitic ulceration or simple ulcers

Dr. Hunner told us a great deal about stricture formation, but did not give us a radical surgical procedure for its cure except gradual and progressive dilatation. Any fibrous growing tissue surrounded by spasmodic musculature or muscular contraction is progressive and will get tighter and tighter, but passing instruments progressively and periodically will, after a while, produce some dilatation and if you let it alone the stricture will recur; hence the radical operation for stricture is excision and anastomosis of the ureter.

I would like to ask the doctor if he has done any of these operations of linear incision and transverse suture. That is another radical measure.

As far as anastomosis is concerned, we nearly always cut the ureter in the lower region near the bladder, either mechanically or by the use of the obstetric forceps, or from removing the uterus, tying up the uterine vessels at this point, and rarely do we get an injury of it above. So I would like to ask some of the gentlemen to tell me, if I should injure the ureter away above the bifurcation of the iliac vessels, somewhere near the middle line, and cut about six or eight inches of it, what to do other than to resort to double ligature?

Dr. Hunner (closing on his part).—In the first place, I wish to express my appreciation of Dr. Judd's paper. I think the Association owes a great debt to any one who reports as many cases of this comparatively rare condition and who handles the subject in the splendid manner in which he did. He had no cut and dried method for treating these surgical conditions of the ureter, but he managed them by the best method that appealed to him at the time and under the circumstances. It is only with such reports that we are going to be able to get enough experience so that we may know what is the best method of handling these various conditions.

As to the discussion on my own paper, I am glad Dr. Kelly mentioned mistaking some of these cases for tuberculosis because I wish to warn the Society against that. You will find in my printed report that I have detailed some cases bearing on this point.

I am glad to add a final word in connection with Dr. Robins' and Dr. Finney's case. I am glad to say that Dr. Finney did not make a mistake in that case. Somehow Dr. Robins must have secured a wrong report as to the pathology of the kidney. It was a mere shrunken shell of a kidney and the only treatment was removal. There was every evidence that she had had trouble from the time she was two years of age, with repeated attacks of pyelitis or infected hydronephrosis in the left side. A high temperature for several days, pain in the kidney, great depression and illness, would appear and pass away with the appearance and passing of a tumor in the side.

A diagnosis of stricture of the ureter was made in the case of Dr. Robins. Before I saw the patient I heard about her in part through her brother, who was a physician in Connecticut. He wrote me the details, saying that Dr. Robins had cared for her at first, and she was then removed to the University of Virginia at Charlottesville, and they were still washing out

the kidney at varying intervals and she was having repeated attacks of pyelitis after lavage. I did not see anything else to do except to keep up the washing. Then he wrote me a letter and told me she was still having these attacks, and particularly after washing. That is an important point to remember in this case. In a case of pyelitis that flares up with a temperature after you have washed the kidney, be on the lookout for stricture. I wrote the brother they were doing everything they could except dilatation of the stricture of the lower end of the ureter. She was subsequently brought to me and I found that to be the case. The kidney held 40 c.c. and quickly contracted down. The first time I washed the kidney she had a temperature of 103° the next day which confirmed the diagnosis of ureteral stricture. The trauma of catheterization caused the ureter to close and the infection gave her this high temperature. An interesting thing in her case was that after I washed the kidney 6 times she wanted to go home for the Christmas holidays. She still had colon bacillus. A month later she returned with the infection absent. In some of these cases we probably do not need to use lavage. If we keep the stricture well open, nature will take care of the infection.

I am glad to hear of Dr. Robins' second case of the removal of the colon. It is most amazing to look over the list of cases I have now of removal of the appendix, then fixation of the kidney in the same case, then investigation for gall-bladder trouble, or duodenal ulcer, and still the patient having the same symptoms she began with ten or twelve years before. Dilating the stricture affords relief. This is the first case of removal of the colon I have heard of.

Dr. Vaughan makes a good point of the possibility of appendicitis resulting finally in a stricture of the ureter. I reported some cases years ago of acute pyelitis due to an acute appendicitis. Some of these cases are blood stream infections, and others are probably direct contact infections between the ureter and appendix. You will find in my printed paper the report of a case in which the symptoms were due to ureter stricture, but in which the *x*-ray reveals a stone shadow which at operation proved to be a stone in the appendix. I shall also report a case of gunshot injury to the ureter. Her stricture symptoms came on eight years after the gunshot wound. Two dilations relieved the hydronephrosis symptoms.

Dr. Judd (closing).—I am very glad Dr. Kelly spoke of the infected kidney. However, in my paper I dealt with cases in which the kidney was not infected. Unquestionably in a certain percentage of ureterovaginal fistulas it is not necessary to sacrifice the kidney, but these patients should be given a chance by transplanting.

With regard to the remarks of Dr. Bovée on the function of the kidney I felt very much the same as he did until I looked up cases. I found one case in which two years after the operation there was a normal amount of urine coming into the bladder from the transplanted side, and in not a single instance where we were able to make later examination had the kidney ceased to functionate. In one case of stricture developing at the point of transplantation (a cancer case) the man died at the end of the third week.

I have been very much interested in Dr. Hunner's series of cases; it opens up a great field.

GEORGE BEN JOHNSTON

IN MEMORIAM

GEORGE BEN JOHNSTON, M.D., LL.D.

1853–1916

Dr. George Ben Johnston was born July 25, 1853, in Tazewell, Virginia, and died December 20, 1916, at the age of sixty-three years, at his residence, 407 East Grace Street, Richmond, Virginia.

His ancestors were noted pioneers, honored statesmen, famous warriors, and distinguished physicians. His mother, Nicketti Buchanan Floyd, was the daughter of Dr. John Floyd, who was a physician of prominence as well as a Governor of Virginia. Dr. Johnston's father was Hon. John W. Johnston, United States Senator from Virginia. To these may be added many illustrious relatives, among them Patrick Henry, who was a great, great uncle, and General Joseph E. Johnston, of Confederate fame.

George Ben Johnston—somehow the very name seems distinctive—derived his name from two Floyd uncles. One of them, George Rogers Floyd, was named for George Rogers Clarke, of the Lewis-Clarke Expedition, in which his father took part; and the other was named for Dr. Benjamin Rush, the distinguished physician of Philadelphia, under whom his father and Dr. Johnston's grandfather, Dr. John Floyd, had studied medicine. There must be a good deal in a name, for George Ben Johnston was a leader and a physician, both

by predilection and inheritance. Born of this brilliant and sturdy stock and reared among the mountains of Southwest Virginia, he grew strong in mind, body and soul.

George Ben Johnston was reared by the rules of no book, nor was he taught to mount heavenward on nicely chiseled stepping stones, nor was he protected from the weather by store paraphernalia, nor was his dress dictated by urban fashions, nor were his associates carefully chosen. His only rules were the broad principles of honor, chivalry, and fearlessness, which applied not only in specific instances but on every occasion. In youth, Ben Johnston's associates were whomever he might happen to meet in a day's journey. He was the intimate friend of the village blacksmith, the mountain trapper and hunter, the town wag and the county scapegoat, as well as of the dignitaries.

The ability to mingle on good terms with all classes never left him. No man, white or colored, was so humble that he could not approach Dr. Johnston on a friendly footing, even after he had become a busy and famous surgeon, and no company was so distinguished that he was not a conspicuous member. Pretentiousness and meanness he despised, but he never scoffed at ignorance or lack of social attainment. He was quite displeased when someone laughed at one of his mountain guests, whom he had met in Richmond one day and asked to spend the night at his house, being discovered next morning standing in the bath tub with his boots on, washing his face from the running spigot.

As a boy, in school and out, he was a general favorite. He gained only a part of his knowledge from books. Much that he knew came by questioning others, and much through great powers of observation. At school he was a fair scholar, and at times an excellent one. His education was begun at the Abingdon Academy. Later he went to college at St. Vincent's, in Wheeling, West Virginia. Here, as at home, he became popular and a leader among the boys.

From St. Vincent's he went to the University of Virginia.

Here, for two years, he took academic work and then, following his natural bent, he devoted his third year to the study of medicine. It was while at the university that his great friendship was cemented for another Southwest Virginia youth, Henry Carter Stuart, afterward Governor of Virginia, and of all his enduring friendships this was the strongest. Leaving the University of Virginia he went to the University of the City of New York to finish his medical education, and there he received his degree in medicine in 1876 at the age of twenty-three.

After his graduation he was offered two excellent positions in New York and one in Pennsylvania. His sense of filial duty being strong, he would not decide upon a location until he had consulted his father; so he went to Washington and discussed with Senator Johnston his plans for the future. The senator told him Virginia needed her sons, and advised him to return home. This he did, and during the following two years practised medicine in Abingdon, being associated with Dr. E. M. Campbell, a physician of wide reputation.

Feeling that he should seek a larger sphere of usefulness, he left Abingdon in 1878 and settled in Richmond, where he spent the remainder of his life. From this time on his reputation grew until he became recognized as one of the foremost surgeons of America. In 1879 he performed the first operation in Virginia under Listerism (antiseptic surgery). He contributed to Keen's *System of Surgery*, Bryant and Buck's *System of Surgery*, and wrote many conspicuous papers, among them being "The Treatment of Osteomyelitis of the Tibia," "Fixation of the Kidney," and "A Description and Report of Cases of the Operation of Splenectomy," and with Dr. Murat Willis he devised and published the Johnston-Willis operation for suspension of the uterus. These and other papers have been extensively quoted.

Dr. Johnston wrote a sketch of the life of Dr. John Peter Mettauer, a pioneer surgeon of Virginia and of America, and read it as his presidential adress before the American Surgical

Association in San Francisco. This address attracted wide attention among the profession both in this country and abroad. Dr. Johnston was a born surgeon who, with wonderful energy, vast resourcefulness, and a tremendous practice, kept himself not only abreast but ahead of the times. He did but few exploratory operations. He used every means of his splendid clinical instinct to make a diagnosis, and he was one of the first men in the South to freely call specialists in consultation. In his operations he was deliberate, skilful, astute, and thorough.

Dr. Johnston was, at various times, president of the American Surgical Association, the highest honor that can be conferred upon a surgeon in this country; president of the Southern Surgical and Gynecological Association, president of the Norfolk and Western Railway Surgeons' Association, president of the Richmond Academy of Medicine and Surgery, president of the Medical Society of Virginia, a member of the House of Delegates and of the Judicial Council of the American Medical Association, delegate from the American Surgical Association to the International Medical Congress at Madrid in 1903, delegate of the United States to the International Periodical Gynecological Congress in 1896, and had many other honors bestowed upon him. In 1905 he was elected professor of surgery and head of the medical department of the University of Virginia, at Charlottesville, which position, however, he did not accept.

Dr. Johnston was connected with the Medical College of Virginia in various subsidiary capacities until 1884, when he was elected professor of anatomy. In 1893 he was made professor of didactic and clinical surgery; in 1896 this title was changed to professor of surgery and clinical surgery; in 1907, to professor of gynecology and abdominal surgery; later, to professor of abdominal surgery; and when the amalgamation with the University College of Medicine was effected, he was elected professor of surgery, which chair he resigned two years before his death to become a member of

the Board of Visitors of the Medical College of Virginia. He was immediately elected a member of the Executive Committee of this Board, in which capacity he served until his death.

He early saw the necessity of a hospital for teaching purposes, and in 1893 he established the Hospital of the Medical College of Virginia, afterward the Old Dominion Hospital. Soon the necessity for a larger and better equipped hospital became recognized, and he interested Mr. John L. Williams and organized and built the Memorial Hospital. Dr. Johnston always thought that a negro hospital was to be desired in Richmond, and he lent his influence in every possible way to a campaign which was successful in raising $250,000 for a seven-story negro hospital and a contagious pavilion connected with the Memorial Hospital. He also organized the hospital department of the City Home of Richmond.

In 1909, he and his partner, Dr. Murat Willis, built the Johnston-Willis Sanatorium, a hospital for their private surgical practice. As outgrowths of this hospital, the Abingdon Hospital was established in 1910, and the Park View Hospital in Rocky Mount, North Carolina, was organized in 1914. Thus to this one man's instrumentality, five active hospitals owe their existence.

During the years of 1911 and 1912, it became obvious that the two medical colleges in Richmond, the University College of Medicine and the Medical College of Virginia, could not exist separately and comply with modern medical requirements. Several unsuccessful attempts had been made to merge the two institutions. In 1910, the University College of Medicine was destroyed by fire and it was rebuilt by the strong efforts of the faculty, aided by popular subscription in 1911. It then looked as if amalgamation of the two institutions was further off than ever. Dr. Johnston and Dr. Stuart McGuire, however, privately took the situation in hand, overcame almost insurmountable obstacles, and perfected plans for the union of the two colleges, which success-

fully culminated in the organization of the greater Medical College of Virginia in 1913.

Dr. Johnston was married first in 1881, in Abingdon, to Miss Mary McClung, granddaughter of Judge Connally Trigg, of Virginia. She died without issue, in July, 1882. On November 12, 1892, he was married to Miss Helen Coles Rutherford, of Rock Castle, Virginia, to whom four daughters were born: Ann Roy, Nicketti Floyd, Helen Rutherford, and Susan Roy. He is also survived by one brother, Colonel Joseph B. Johnston, and three sisters, Mrs. Henry Lee and Miss Coralie Johnston, of Richmond, and Mrs. L. J. MacMullen, of Baltimore. Dr. Johnston was a most devoted son, brother, husband, and father. No man could be more affectionate, more loved, or more loving in his home circle. He liked to have his family around him and he kept an open house. He was never so happy as when he could do something for a relative, near or remote. Hospitable, gracious, and polished, he made a delightful host on any occasion. A meal at his home served in the true old Virginia style, with his charming wife presiding and his beautiful daughters present, was a delightful event.

Dr. Johnston was a handsome man; in fact, he was more than handsome—he was distinguished looking. About average in height, his bearing was such that he gave the impression of being taller than he really was. His head was splendidly shaped and his hair, brown and wavy in early life, gray in mid-life and white later, grew gracefully about his broad, fine brow. His features were regular and clear cut. His face and forehead were seamed with lines of care, but his complexion was ruddy and his expression extremely mobile. There was no hiding his feelings behind a mask, but he had a way of concealing his thoughts by a quizzical expression, so that one could never tell what question he was going to ask or what he was about to say. His most marked feature was his eye—hazel-brown, clear, intelligent and on occasion capable of being lit by a most intense fire or of expressing great mirth.

His manners were quiet and gracious. He never appeared in a hurry and in conversation was always attentive. When you entered his office or the room where he was, he arose to greet you and offered you a seat and put you at ease with some kindly inquiry or some pleasantry.

Dr. Johnston had a high-pitched voice which added piquancy to his conversation and probably made one pay closer attention because of its distinctiveness, but which kept him from being a forceful public speaker. In speech he was deliberate, in statement accurate, in argument conclusive, and it has been truthfully said of him that he was "powerful in counsel." In argument or in giving advice he was logical, persuasive, reasoning, witty, at times sarcastic, but never vociferous, heated or impatient. His courtly and gracious manner, his distinguished appearance and elegance of poise were such that upon his entrance he immediately became the center of attraction of nearly any gathering, and men instinctively paid him deference.

Dr. Johnston had an enormous surgical practice and a most grateful clientèle. He had a remarkable hold on his patients and with implicit confidence they put themselves in his hands and followed his advice. They not only believed in him but they loved him and idolized him. As he went from room to room making his rounds, it was a rare treat to see him infuse the radiance of his wonderful personality into the sick room. A few perfectly chosen words from him would change the whole attitude of a patient from dejection to hope or from despair to resignation. Dr. Johnston was a friend such as few men are capable of being. He was not only loyal, but, for his friend he was willing to undertake anything however difficult.

His love for some of the younger members of his profession was beautiful. They gathered around him as his disciples, and before he died he asked that they should be his only pallbearers. Unlike many great clinicians his help to the young doctor did not consist in placing him on a salary basis as one

of many assistants, but he referred patients to him directly for examination or opinion. If he had confidence in a young man this confidence was complete. The position attained by many physicians in Richmond today is due to the fact that they were regarded more as "partners" than as "assistants" on Dr. Johnston's large staff. To these younger men, thrown into daily contact with Dr. Johnston's wounderful personality he was more like a father or older brother.

His stories, anecdotes and sayings his friends will never forget, but no one will ever be able to repeat them as he told them; many were simply spontaneous trite remarks, but they were the last word on the subject; many of them were told to teach a lesson—and this lesson was never forgot; many of them were reminiscent of days gone by—but you lived in the scenes; many were told only for the entertainment of his friends—and they were always enjoyed.

Dr. Johnston had some heart trouble the last few years of his life and he gradually relinquished the bulk of his operative work to his partner, Dr. A. Murat Willis. The last several weeks of his life were spent in bed, with the exception of the day of his death, when he felt so much better that he got up, partly dressed, and while shaving dropped dead from what was evidently a coronary embolism. The fall was heard by members of his household, who rushed to him, but found him beyond human assistance. So he died suddenly and while on his feet, as he should have died and as he would have wished. Previous to the last few years of his life, Dr. Johnston had been in practically perfect health, and except for an attack of catarrhal jaundice he had never been in bed a day. The feeling of either mental or physical fatigue was almost unknown to him and he had rarely taken a dose of medicine. On one occasion a few months before he died, when he heard a young physician complain of being tired, he was heard to say that he could recall having felt actually tired but five times in his whole life. In spite of this record of good health, when at last he did become ill, he made a

most excellent patient, never calling unnecessarily upon his physicians or his family, never impatient, and always taking his medicine without question.

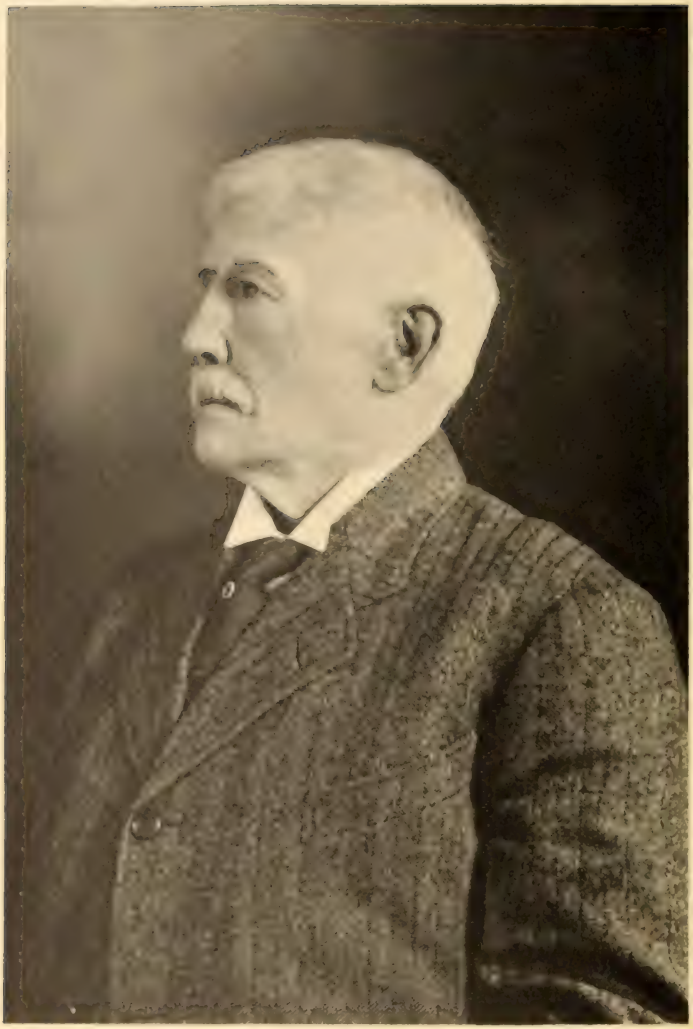
There live in the minds of his friends many things that he said during his last illness, most of which were little admonitions or expressions of kindness. He had known for some time that the end might come at any moment, and he made his preparations simply and deliberately, without emotion, reverently, and with consideration for those around him. Like a soldier wishing to be buried in his uniform, at his request he was interred attired in his white operating clothes.

The news of his death spread rapidly and soon his residence was crowded with friends and relatives. Many of his physician friends from a distance came to Richmond to pay their respects to the memory of the departed. The funeral was held at St. Peter's Cathedral, with Bishop D. J. O'Connell officiating. Dr. Johnston, at his request, was buried with a low mass, and he was borne to his rest by the loving hands of the young physicians to whom he had been both friend and benefactor.

The interment was in beautiful Hollywood, near the crest of one of its stately hills which overlook the falls of the historic James River. And thus was closed from earthly view a life made glorious by many gifts from God, a life made useful by arduous service to his fellow man; and a life made hallowed in the memory of those who knew him best, by both.

"To live in hearts we leave behind is not to die."

BEVERLEY R. TUCKER.



JOSEPH A. GALE

JOSEPH A. GALE, M.D.

1842–1916

Our late Fellow, Dr. Joseph A. Gale, of Roanoke, Va., died July 5, 1916, at the age of seventy-three years. He had been in failing health for some time, but was taken seriously ill about nine days before his death. He will be sadly missed from the roll of this Association, of which he has been a Fellow since 1903.

Dr. Gale was one of Roanoke's oldest as well as leading physicians and surgeons, and had been prominently identified with the medical fraternity in this section of Virginia for many years. For nearly half a century he had filled the important position of chief surgeon of the Norfolk & Western railway. He was the first and only one to hold this position.

Dr. Gale, son of Enoch R. and Louisa Gale, was born in Norfolk, December 3, 1842. As a boy he attended the schools of his native city, and was a student at the Norfolk Military academy.

At the outbreak of the Civil War, he enlisted in Captain Frank Huger's battery of field artillery, serving for about eighteen months, and participating in the battles around Richmond. He was then transferred to the medical department of the Confederate Army as hospital steward, in charge of the dispensary of Chimborazo Hospital, Richmond, remaining there until the close of the war. By special order of the surgeon-general of the Confederate Army, he was permitted to matriculate at the Medical College of Virginia while in the army hospital service, and it was at this institu-

tion that he laid the foundation for the professional education which, after the war, was supplemented by a course at Bellevue Hospital Medical College, New York, graduating from that institution in 1866. For half a century he had been in active and uninterrupted practice of his profession. He had at all times interested himself in the various medical organizations of the country, being a member of the American Medical Association, International Association of Railroad Surgeons, Medical Society of Roanoke, Southern Surgical Association, and the Medical Society of Virginia, being president of the latter in 1903 and 1904.

He was an enterprising, public spirited citizen and a large investor in Roanoke real estate, owning and controlling some of the business property in the city. For years he had been closely identified with a number of enterprises which have been largely instrumental in the city's advancement and prosperity.

Dr. Gale was a Methodist, a member of Greene Memorial Church. He was actively identified with the building of the First Methodist Church at Big Lick, and was afterward treasurer of the building committee in the erection of the old Greene Memorial Church, now occupied as a place of worship by St. Mark's Lutheran congregation.

In June, 1869, he married Pattie Burwell Harvey, daughter of Robert Harvey, of Roanoke County. She died eleven months later. On October 1875, he married Eliza Simmons, daughter of Captain Sparrell F. and Isabel (Harvey) Simmons. Mrs. Simmons was the daughter of Colonel Lewis Harvey. To his second wife two children were born: Dr. Sparrell Simmons Gale and Charlotte Dryden Gale, both of Roanoke, Va.

Besides the children named above, he is survived by his widow.

JOHN BENJAMIN MURPHY

JOHN BENJAMIN MURPHY, M.D.

1857–1916

The friendship of Dr. Murphy has meant so much to me personally and his contributions to surgical progress and his teachings have been of such high value, that I have welcomed this opportunity to pay my sincere tribute to the memory of the first surgeon of our time.

In every department of human activity there appears at long intervals an intellectual star—a mind that finds new paths through which new worlds are disclosed. Sometimes genius exists without idealism; sometimes genius exists without the power of compelling conviction by voice or by pen; sometimes genius is inert; but in Dr. Murphy there was a creative genius with the highest ideals; a genius which vitalized the truths he discovered into the precepts and the practices of his comtemporaries.

John Benjamin Murphy, the son of sturdy immigrants, was born on a farm in Wisconsin in 1857. The outdoor life of the farm plus the ambitious design of the parents that their children should secure the best that the new country could offer account in large measure for the vigor and the persistence which made possible his vast accomplishments.

That nature was lavish in her gifts to this youth is shown by the fact that he had passed through the public schools in Appleton and had received the degree of M.D. from Rush College before the completion of his twenty-second year.

Himself the product of great teachers at home and espe-

cially abroad—in Vienna, Berlin, Heidelberg, Munich and London—it is not surprising that he himself became the greatest surgical teacher of our time.

He taught the nurse, he taught the medical student, he taught the intern, he taught the young physician, he taught the veteran, he taught the laboratory worker, he taught the young surgeon, he taught the master surgeon, he taught the teachers of surgery. He taught us by the example of his earnest intensive labor on behalf of his most humble patient, he taught by conference, by lucid clinical demonstrations; he vitalized dull statistics; with masterful logic, he wove and epitomized masses of evidence into convincing arguments and drew sound conclusions.

No one could misunderstand Murphy. Each visit to his clinic brought possession of new truths. Everyone fell under the spell of the original eloquence of this incomparable teacher. Who can ever forget his stirring addresses, his epigrammatic discussions at our larger meetings? Again and again the audience took the regular program out of the hands of the presiding officer and demanded more and still more from Dr. Murphy. I have never known a man on any pretext to leave his place in the ever-crowded theaters where Murphy spoke. Dr. Murphy also taught by numerous contributions to medical journals, by editing annuals; he taught by monographs as others have taught by spoken precepts. Dr. Murphy has taught the surgical world a surprising amount of what it knows, for example what it knows of intestinal anastomosis, of appendicitis, of peritonitis, of ileus, of the surgery of the stomach and gall-bladder, of the genito-urinary tract, of tuberculosis, of surgery of the bloodvessels.

We think of Murphy, however, not only as the teacher *par excellence*, but also as a great original investigator, for to no other man in his time was given the power to lead surgery in practically all its fields.

Because it was his last chapter, we are apt to think of his preëminence in the surgery of the bones and joints as being

his strongest leadership, but in truth his leadership has been equally marked by his contributions in all the following fields:

1. The early diagnosis and operation in appendicitis.
2. The treatment of peritonitis.
3. The surgery of the bloodvessels.
4. The surgery of the stomach and the intestines in connection with which he produced the epoch-making button.
5. Gas compression of the lungs in tuberculosis.
6. Surgery of the bones and joints.

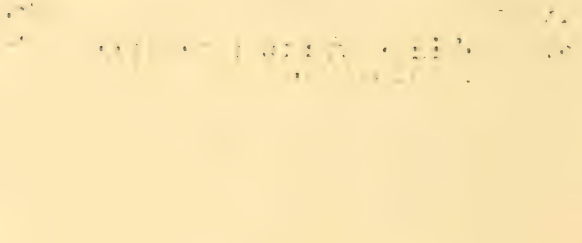
We must think of Dr. Murphy not only as the greatest surgeon of his time but as a great and altruistic force throughout the whole surgical world. Not only in this country but also abroad the name of Murphy is preëminent, for, more than any other man, Murphy internationalized American surgery. And last and dearest to our hearts, we cannot think of Dr. Murphy but as our friend.

His greatness was never more exemplified than by the courage of his last months, when in the grasp of an illness, itself the result of his unremitting and great labors, he still continued to extend his services to his patients and to teach in clinic and by publications.

We may regret the loss of the achievements which in the light of his past accomplishments might well have been expected during the additional years of life which should normally have been his. Although his surgical practice was limited to thirty-seven years, yet he accomplished enough in that period to make him the greatest surgeon of his time. Dr. Murphy's work and his early death reminds one of the lines from Festus:

> "We live in deeds, not years—
> In feelings, not in figures on a dial;
> He most lives who thinks most,
> Feels the noblest;
> Acts the best."

GEORGE W. CRILE.



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